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The Radio Problem in Change-overs

THOSE supply undertakings which changed over their systems from d.c. to a.c. more than five years ago were fortunate. Then the unknown factor in the replacement of apparatus in residential areas was the vacuum cleaner; to-day it is the all-mains wireless set.

We have a great deal of sympathy with the other undertakings which have still to take the plunge in their difficulty in meeting the obligation to put their consumers into as good a position after the change-over as they were before. They will naturally try to avoid unnecessary expenditure such as is due to the opportunity open to some consumers to claim more than their rights, but we believe that their methods are not always wise.

Arising out of the article by Mr. R. H. Cobbold on "Radio Apparatus and Change-overs" in a recent issue, a reader has sent us a copy of the conditions for the supply of electricity for d.c. wireless sets issued by an important undertaking. Other supply authorities who contemplate taking steps to protect their position, and who may be inclined to accept this document as a model, should consider its weaknesses.

The conditions are that d.c. receiving sets must be connected to a separate circuit fed from the mains through a milliampere meter, for which £3 3s. or a rental of £1 1s. per annum is asked; the units so recorded are charged at 6d. While the energy required for the set alone might not move a d.c. meter, in most cases lighting would be in use at the same time; moreover, the supply for radio is chargeable as power (according to a recent statement in the Commons), but that, we believe, does not necessarily mean at the ordinary power tariff, and the rate might be higher than that for lighting (as it is in the present instance), provided that all similar consumers receive the same treatment.

Price differentiation should, however, bear some relation to the cost of production; a.c. radio consumers are entitled to 1d. per unit, and there seems to be no valid reason for the fivefold increase, especially as the ordinary d.c. power rate is the same as the a.c., and the lighting only 20 per cent. more.

These provisions seem punitive, but there is even less justification for the alternative that sets may be connected to existing circuits at standard power or lighting rates if their owners indemnify the undertaking against any liability to adapt the apparatus subsequently for a.c. working.

A provision of this kind has hitherto been regarded as reasonable with regard to appliances connected after the publication of notice of a change of system, but the Electricity Commissioners' consent usually limits the period to six months. In the case under mention there is no suggestion that a change-over will take place within a specified time.

The imposition of such conditions is likely to check the installation of wireless sets, but if any considerable body of consumers proves recalcitrant, we believe that the undertakings concerned will land themselves into difficulties greater than those from which they hope to escape.

Electrical and Thermal Conductivity

THE relative thermal conductivities of metals agree closely with their electrical conductivities, but the values attached to them are influenced markedly by their purity. In view of the tendency towards the adoption of higher temperatures in many branches of electrical engineering, a reliable standard of comparison is called for, and a continuation of the researches described in the paper which Mr. R. W. Powell read before the Physical Society a few days ago should yield results of great practical importance. He shows that the thermal conductivity of Armco iron (99.92 per cent. pure iron) was 0.177 c.g.s. unit at 0 deg. C. (decreasing to 0.171 at 800 deg.). This value is higher than that hitherto found, due presumably to impurities in the specimens used by earlier investigators, but in chemically pure iron it reaches 0.194 at 0 deg. C. The electrical resistance of the Armco iron was 9.6×10^{-6} ohm. per

cm. at 0 deg. C. (increasing to 105.5×10^{-6} at 800 deg. C.), the Lorenz function increasing between 0 deg. and 400 deg. and remaining approximately constant up to 700 deg. C. The determination of thermal conductivity of metals by comparison with standard rods of Armco iron should yield striking results.

Superseding the Horse

THE demonstration of electric delivery vans by the Coal Utilisation Council was another reminder that electricity provides the best method of using coal for most purposes. It shows, as did the display of similar vehicles at the recent I.M.E.A. Convention, that for town work, where distances between stops are short and the maximum speed required is not very high, such as in goods delivery and refuse collection, the battery vehicle should have excellent prospects. At the present stage we should regard its most practicable sphere as doing the work now performed by the horse. The extension of its operations outside urban areas is a problem at present, owing to the limits in speed due to the weight of the battery and to the lack of charging facilities on the road. More might be done by supply undertakings and electrical manufacturers in popularising the battery van by employing it themselves.

Bequests for Benevolence

FOR many years past, in their efforts to put the funds on a more substantial basis for pension purposes, presidents and executives of the Electrical Industries Benevolent Institution have appealed to those who have obtained large personal profits from the electrical industry to follow up the generous contributions made during their lifetime with substantial bequests in their wills. Unless some very large sums can be added to the £50,000 now invested it will be many years before the organisation can face up to more or less legitimate pension responsibilities. It is pleasing to record that under the will of the late Sir George Sutton, Bt., dated February, 1932, £1,000 falls to the fund of this Institution, of which he was president several years ago. In addition, the Benevolent Fund of the Institution of Electrical Engineers benefits to a like amount. May we avail ourselves of the occasion to suggest that others in a position to do so should follow so excellent an example?

A Jump in Imports

THE most pronounced feature of the Board of Trade returns of imports and exports for May was the sudden increase in the value of electrical imports, which was about £354,000 as compared with £185,000 in May, 1933, *i.e.*, about double. As a large part of the increase was shown against radio apparatus, and as the greatest increase in the analysis of imports by countries was attributed to the United States, it seems quite obvious that American wireless equipment was the main factor. This is probably a reflection of the altered exchange conditions. It should be said, however, that there were also large rises in cable and instrument imports, while the shares of the Netherlands and Belgium made substantial advances. The exports were much on a level with those of May last year. Notable exceptions to the general rule were the lower figures shown for electric generators and telegraph and telephone instruments, and the increases recorded for other classes of machinery.

Manufacturing Results

SEVERAL well-known electrical manufacturing companies have published, during the past week, trading results which can only be regarded as satisfactory considering that last year was one of unusual difficulty for the electrical industry. Three companies, Henley's, Callenders', and the General Electric, have all maintained their dividend distributions. The evidence already available from other sources regarding the improvement in overseas business receives confirmation. In the twelve months ended with March last the General Electric Co. experienced a steady increase in export trade, though this was still very much below the normal; Australia and South Africa were markets showing definite improvement. Callender's have been experiencing a distinctly better overseas activity during the last few months. Though contracts for the grid have fallen away, they have been occupied with subsidiary extensions, but the year was not one of large orders, as readers are aware. The heavy engineering and telephone business booked by the General Electric was not satisfactory, but late in the year these sections looked up, and the number of employés at March was 1,532 more than a year ago. The recently announced telephone expansion policy of the Post Office and the works electrification movement in industry should bear fruit in this and later years. It is interesting to note that the assets of the Contributory Pension Fund of the G.E.C. stand to-day at over a million pounds.

Atmospheric Grease

Before the British Science Guild Professor E. N. da C. Andrade referred to the thin film of grease that is deposited on a surface exposed to the atmosphere, which makes it difficult to obtain the absolute cleanliness required in some chemical operations. This natural film is usually not enough for the engineer who desires to cut down friction by floating a moving body on a layer of liquid, a good example of the principle being the thin oil wedge formed in the Michell thrust block by the use of tilting slippers. On the other hand, the normal surface contamination may be too great for certain engineering requirements. Thus recent investigations that have been brought to our notice indicate that drop formation on a condenser tube is due to the presence of a thin greasy film, a view that appears to be at variance with that generally held, pointing to the value of cleanliness on both inside and outside surfaces of the tubes.

The E.C.A. Conference

THE organised electrical contractors and their friends meet at Buxton on Wednesday next for their annual Conference. Apart from the presidential address the chief subject for discussion will be that introduced by Sir William Ray. As this will be Sir William's first full-dress appearance at such an event it will be interesting to hear what he, as executive chairman of an entirely electricity supply E.D.A., has to say to electrical contracting interests concerning ways in which they can assist E.D.A. to increase the demand for electricity.

An Opportunity Lost

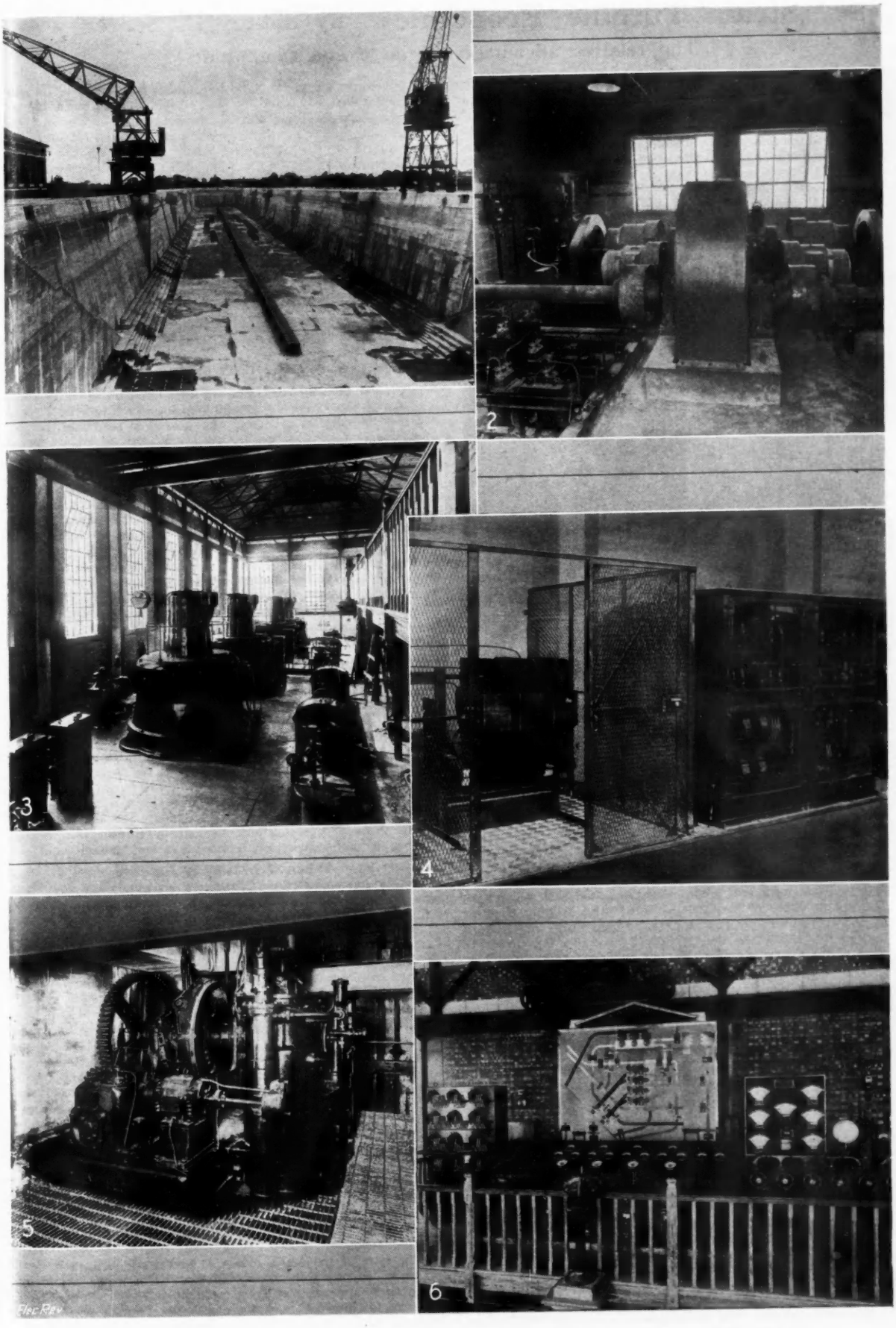
A DAY or two ago we were shown a letter sent out by a supply undertaking that had changed over its system from d.c. to a.c. The recipient was informed that the work had been completed, and that inspection of his installation during the course of its progress had revealed certain (scheduled) defects which should be put right. The consumer believed this to be an official demand that he should incur expenditure on account of something that was due to the change-over, and a quick reading of the official-looking missive showed that there were grounds for this impression. In reality the undertaking had given him free expert opinion, but by its method of tendering its advice had missed a good opportunity of showing that it had the interests of its consumers in mind.

The Difference

THE following was discovered in an Indian contemporary:—

> Another peculiarity is that while one is exposed to d.c. current there is a tendency to repell the body. Quite the reverse is the case in the case of a.c., which attracts the body, making it difficult to disentangle when one comes in contact with it. The risk of being electrocutioned is, therefore, much greater in the case of a.c. if exposed to it than in the case of d.c. Most of us have experienced a shock from the direct current. It has seldom proved fatal, but in the case of alternating current one will seldom survive unless Providence comes to his rescue.

This appears to be a perfect argument against change-overs.



Electrical Equipment at the Southampton Docks. (See page 895)

1. The graving dock from the caisson, with a 50-ton crane (left) and a 10-ton crane. 2. The two caisson haulage sets; left front, motor change-over switches. 3. Motors driving the main graving dock pumps; right, fire-pump motors and gear units for resetting valve clutches. 4. The main pump motor rotor contactor panel and (left) one of the e.h.p. stator air-break switches. 5. Automatically closing main pump discharge valve. 6. Illuminated panel, control desk, selector relays and level indicators for the main pumping system

Steam Turbine Economics. By Sidney D. Scorer

The relative advantages of large and small units

THE function of the technical advisors guiding the capitalist is to enable him to reap the maximum financial profit from the minimum outlay. High thermal efficiencies, low fuel and steam consumptions mean nothing to the investor if unaccompanied by increased revenue, so that sometimes it is better from the financial point of view to install a comparatively inefficient but cheap machine than a more costly unit with a high thermo-dynamic efficiency. When fuel is plentiful and cheap, thermo-dynamic efficiency becomes of secondary importance, and the demand is for a machine that will generate electrical energy at a moderate efficiency without incurring additional charges to obtain the increased efficiency. Within recent years, high fuel and similar costs have resulted in a serious investigation of the problems affecting power station efficiency, and numerous solutions have been put forward.

Mr. S. D. Scorer

Every projected power station—either for private or public service—must be considered individually, and with due regard to local conditions. Reliability is of primary importance in the selection of equipment, steam and fuel consumptions ranking next. A low fuel cost may be counterbalanced or even neutralised by a number of other factors. For a given output, the power may be developed by a single large machine, by two machines, each giving one-half the required output, or by several smaller units.

Capacity and Space

In the layout of every turbo-alternator there is inevitably a certain amount of space that cannot be utilised and is therefore wasted, and while small machines imply lighter and cheaper foundations, for a total power of, say, 50,000 kW, five 10,000-kW sets would occupy a greater space (with consequent increase in land costs), than two 25,000-kW units or one 50,000-kW unit. Moreover, the several small generators would require a larger building to house them, leading to a further increase in capital and upkeep costs. Each small set would require its individual condensing, extraction and water-circulating appliances, each adding its quota of inefficiency and that extra allowance of power made by every designer for emergency conditions, and each section requiring its share of maintenance and watch-keeping charges. A large machine, on the other hand, has only one set of auxiliaries, and while the cost of these may approximate to that of the several smaller sets, their efficiency will be higher.

The installation of a number of small machines increases the reliability of the station as a unit. Moreover, when the load fluctuates considerably, the small unit plant would probably show up to better advantage than the single large set, as only the number of small turbo-generators sufficient to carry the load need be run. Each machine would therefore work at its maximum capacity and so under the most economical conditions, the remaining sets being kept ready as stand-by units.

Again, large outputs generally mean lower rotational speeds and heavier turbine parts. Smaller machines running at 3,000 r.p.m. have a comparatively small cylinder capacity and smaller forged and cast parts, with, consequently, a smaller volume of metal to heat up preparatory to going on load. Temperature stresses are therefore less, and the machine may be run up to speed more quickly in an emergency. Incidentally, the cost of repairs to small parts is obviously less than to larger and more unwieldy ones. The cost per ton of the smaller machines is said to be lower than that of a large unit, as the price of large forgings and castings rises greatly with increase in size owing to the difficulties encountered in manufacturing sound products.

Most engineers, in this country at any rate, will agree that it is hardly yet wise to concentrate 100,000 kW in a single machine, unless the load be waiting for it. In average conditions, load fluctuations are such that a turbine of this power would probably work at an average of about one-half to three-quarters capacity during its greatest revenue-producing years, *i.e.*, the first ten years of its life, and would therefore be less efficient thermo-dynamically, and certainly more expensive in standing-charges than several smaller units developing the same total power. For stations of this magnitude, I would suggest that there is a strong case for the 25,000-kW to 30,000-kW unit running at 3,000 r.p.m. and utilising all possible modern improvements, as against a number of 10,000-kW units running at the same speed, or one large set working at a lower speed.

In a given district, a 30,000-kW set could be installed as soon as required by the increase in electrical consumption, and could be worked at full capacity, and at its highest efficiency from the day it was fully run in. Thus the maximum return from the capital invested is possible immediately the revenue-producing machine is commissioned. A power station provided with, say, four 30,000-kW, 3,000-r.p.m. turbo-alternators fulfils the requirements of reliability; it can be worked at its highest efficiency at one-quarter, one-half, three-quarter and full load, and, if the turbines be suitably designed, can carry an overload for a short period without undue loss in efficiency.

Nozzle and Blading Considerations

One of the problems encountered in steam-turbine design is the difficulty of providing the necessary first-stage nozzle and blade heights to ensure good efficiency. The efficiency of a nozzle falls off rapidly when its height is reduced. At small heights it is lower than might be expected, and there would seem to be an interference with the flow conditions, as though the surface streams met in the main path through the nozzle aperture. Similarly, the blading efficiency decreases rapidly with decreased blade length, the losses being proportional to the ratio of circumference to the area of section. In small machines, therefore, it is somewhat difficult to obtain the high nozzle and blading efficiency demanded by modern conditions. Again, in the small machine, the problem of leaving losses arises. By reducing these to a low value it is possible to evolve a highly efficient turbine, but the extra cost of this increased efficiency may not be so easily justifiable as in the case of a turbine for a large output.

In any effort to obtain maximum efficiency it is permissible to utilise modern refinements so long as the extra cost is not disproportionate to the gain, and this has resulted in the present-day extended use of high steam pressures and temperatures, inter-stage reheating of the steam, and regenerative feed-water heating. In stations where the load warrants the installation of units of from 25,000 to 50,000 kW, the small turbine shows up disadvantageously, as the larger sets can derive more benefit from these refinements. High steam conditions raise the overall efficiency in that they increase the available heat drop through the machine, the steam consumption being decreased with subsequent reduced flow and leaving losses.

When Reheating is Justified

The drawback of increasing only the steam pressure is that the steam becomes wetter at an earlier point in its expansion through the turbine, so that the proportion of moisture in the low-pressure stages becomes excessive unless measures are taken for its elimination. The extraction of the steam from the turbine for reheating to a predetermined temperature is costly, and is not justifiable unless the total output is comparatively large. Reheating is more applicable to multi-cylinder machines than to single-cylinder machines of the order of 10,000 kW unless the last-named are used as back-pressure turbines.

Similar remarks apply to the use of regenerative feed-water heating. Theoretically, the number of feed-heating stages should be infinite, starting with feed water at vacuum temperature and finishing with feed at the temperature of evaporation. Actually, of course, this is impracticable, and the limiting number is about five. This number is adopted only in machines for very high powers, as, for instance, the State Line 208,000-kW set, and is, in fact, only justifiable when the output is large, so that the small machine with its one or two stages is again at a disadvantage. In a 50,000-kW turbo-generator it is practicable to use four stages of feed-water heating, as exemplified in the set of that power at Dunston "B" station.

The laws of economics obtain in power engineering no less than in ordinary commercial activities. The object in putting in a turbo-alternator of given capacity is to earn a profit on the capital invested, and not merely to give the engineer-in-charge an opportunity of demonstrating his skill in obtaining high efficiencies. The foregoing article might be summarised by saying the large and small machines have their respective merits; the deciding factor is which will give the maximum financial return in the circumstances for which the machine is intended.

SOUTHAMPTON DOCKS

ONE of the best stories we have had to tell is that concerning the latest extension to the docks system of the Southern Railway at Southampton. The scheme, which was started in 1927 and is now nearing completion, embraces a new quay wall about one and a third miles long from Royal Pier to Millbrook Point on the bank of the River Test, with suitable dredging for the reception of the world's largest liners; a fine installation of loading and unloading cranes; the reclamation of 400 acres of land behind the new wall, providing many excellent factory sites; four very large cargo and passenger sheds; and the largest graving dock in existence (King George V Dock), which was opened by His Majesty last year. The pumping arrangements for the dry dock, the operation of the enormous dock caisson (entrance gate), the modern cranes and the excellent lighting of the sheds justify the application of the term "all-electric" in its fullest sense to the scheme.

The Graving Dock

The new graving dock is 1,200 ft. long, 135 ft. wide, between the buttresses, and 56 ft. deep (45 to 48¼ ft. effective water depth). Its entrance is sealed, when required, by a box-type sliding caisson measuring 142 ft. long, 30 ft. wide, and 59 ft. deep, and weighing 4,600 tons with water ballast. The dock is opened by sliding this caisson into a specially constructed basin by rope haulage.

In a separate brick building at the far end of the basin are two winding sets which drive, *via* a common shaft, the exterior winding drums, one at each end of the building or side of the caisson basin. Each winding set is served by an 80-h.p. and a 16-h.p. motor. When starting up, the small motors only are put into commission, drawing the caisson along its steel runners at 5 ft. per min. during the first four feet of travel. Change-over to the larger motors is effected automatically, and the caisson then travels at 20 ft. per min. until there is only 4 ft. of travel left. There is then another automatic change-over, and the small motors again draw the caisson at the lower speed for the rest of the journey.

By a return system of winding, with reversal of the motor rotation, the caisson is hauled back into the closed position in a similar sequence of operations. Through suitable gearing screwed rods are revolved at speeds in proportion to the speeds of the caisson, and metal strikers move along the rods, always with a definite relationship to the position of the caisson. Correctly placed switches controlling these motors are operated by the strikers at the proper times. The motors and the switchgear for this haulage installation were supplied by Messrs. the English Electric Co., Ltd., & Electric Control, Ltd.

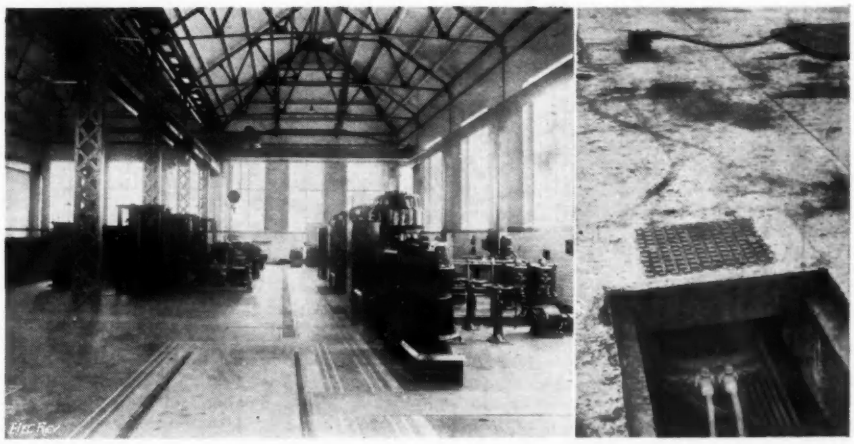
When docking, something like nine million cu. ft. of water has to be removed from the dock, and for this purpose there are four 54-in. vertical-spindle centrifugal pumps. Three of these pumps will empty the dock in about four hours. The pumps are situated 40-ft. below ground level in the basement of the adjacent pump house, and are driven directly by 1,250-h.p. synchronous induction motors, 272.3 r.p.m., 0.95 p.f., 6.6 kV, placed at ground level. An unusual feature of the starting equipment for these large motors is the air-break switches for the stator control. There is a pair of these 6.6-kV switches to each motor. One switch has a resistance in series with it, and is put into operation first, so as to check the make-circuit current, and after a short interval the second switch short-circuits the first one and its resistance. For the rotor control there are l.p. contactors which put in and take out circuit resistances as required. Final governing of this equipment is by push-button from a desk-type controller.

To prevent reverse turbine operation of the pumps in the event of current failure, &c., there is in each discharge-line a valve specially designed to close automatically under the required conditions. A motor drives the valve *via* a friction clutch, and this clutch can be released by a trip gear which is normally prevented from operating by a solenoid. These clutch gears are situated on an intermediate basement floor between the pumps and the motors.

In addition to the main pumping equipment there are three 16-in. pumps for drainage and storm water, driven by 200-h.p. induction motors; two 30-h.p. motor exhausters for priming the main and drainage pumps; one 35-h.p. and two 32-h.p. motor pumps for ships' auxiliary condenser feeding; two 135-h.p. pumps for supplying water at 120 lb. per sq. in. to ships' fire-extinguishing equipment; two 23-h.p. equipments for the removal of leakage water in the pump room, and two 3-h.p. units for dealing with leakage water in the valve pits. The last-mentioned pumping equipment is duplicated in a separate housing on the far side of the dock for the valves on that side.

Control by Illuminated Diagram

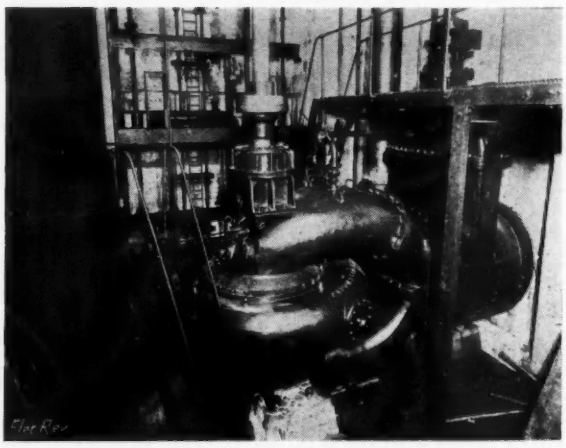
All the main valves in the system are electrically operated and controlled from the desk-type equipment already referred to, *via* selector relays, and an outstanding feature of the pumping control system is a diagrammatic illuminated indicator. After the style of a modern h.p. distribution system indicator board, a group of two red and two green lamps represents each valve and each pump under control. One red lamp (top) "on," and one green lamp (bottom) "on" show, respec-



Left: Storm-water pumps and rotary convertors at east quay station. Right: Cable culvert, showing section fuse junction box and a crane plug connector

tively, when the valve is fully open or fully closed. Decrease of light intensity of the other red lamp with increase of light intensity of the other green lamp denotes that the valve is closing and indicates the approximate stages of operation—and *vice versa*.

This pumping station is one of the feeding points on the ring-main system supplying the docks as a whole with electricity at 6.6 kV, from the Southampton undertaking. Reyrolle switchgear controls the e.h.p. incoming and feeding points, and for the d.c. supply to the quay cranes and the cargo sheds, &c., there are in this pump house one 1,000-kW and two 500-kW rotary convertors, suitable transformer equip-



One of the main graving dock pumps

ment and starting panels, and an open-type d.c. distribution switchboard.

The main contractors for the pumping installation were Gwynne Pumps, Ltd., and the pumps are of that company's manufacture. The motors and rotary convertors were produced by the General Electric Co., Ltd., the control gear, including the stator and rotor switchgear, by Electric Control, Ltd., while a panel equipment with instruments for indicating levels in various parts of the system and the illuminated indicator board were supplied by Messrs. Evershed & Vignoles, Ltd. A stand-by supply sufficient for such light work as valve operating, &c., is provided by two 150-h.p. four-cylinder Crossley Diesel engines directly coupled to 125-kVA B.T.H. alternators.

The pumping equipment in a station at the other (east) end of the quay deals entirely with storm water, and includes three 42-in. Gwynne pumps driven by 250-h.p. vertical d.c. variable-speed motors supplied by Crompton Parkinson, Ltd. This station is another feeding point from the e.h.t. supply system, and in it there are also three 500-kW G.E.C. rotary convertors, together with the necessary transformers and control gear.

Quayside Distribution

The two pumping stations and sub-stations are linked by a cable system within a continuous duct measuring about 4 ft. by 3 ft. along the whole 2,300 yards of quay wall, and on this distribution system the rotary convertors in both stations can be run in parallel. The d.c. distribution system is 480 V, three-wire, and the quay is divided up into 1,800-ft. sections, each fed from one of the main distributors *via* an ironclad junction and fuse-box clamped to the roof of the duct immediately under an inspection cover. The distribution cables are all lead covered and are bracketed to the side of the duct.

We were particularly interested in the arrangements for supplying the quay cranes at intervals of 50 ft. along the cable duct. There are specially designed three-pin sockets for the reception of the trailing cable plugs. There are two covers to each plug box, one cover being actually a dummy plug with the two " conductor " pins made of insulating material and the earth pin a real one, so that when the connection is out of commission and the cover is on, the sockets are completely filled in, with the result that moisture troubles due to sweating, &c., are entirely eliminated. The other cover is merely a door to a chamber for the accommodation of the dummy plug during the time when it is not in use.

Mr. H. Wauchope, the dock's electrical engineer, to whom we are indebted for help in the collection of this information, and who has been responsible for the design and layout of the whole of the electrical installation, is obviously and justifiably proud of this crane-connection system, for he is responsible for the actual plug design. The plugs were manufactured by Messrs. L. Weekes (Luton), Ltd.

On an 18-ft. centre track along the quay wall and over the cable duct run two-ton and five-ton electric cranes. Each five-ton crane is equipped with a 50-h.p. motor for full-load hoisting at 100 ft. per min.; a 15-h.p. motor for slewing at 0.9 r.p.m.; a 7-h.p. motor for luffing at 120 ft. per min.; and a 15-h.p. motor for travelling at 50 ft. per min. The corresponding motor sizes and duties for the two-ton cranes are: hoisting, 40 h.p., 200 ft. per min.; slewing, 10 h.p., 1.1 r.p.m.; luffing, 7 h.p., 160 ft. per min.; travelling, 13 h.p., 50 ft. per min.

Each of the larger cranes has a fixed barrel equipped with a combined magnetic and floating brake and a foot brake, while each two-ton crane has a free barrel with an electrically operated clutch for engaging and disengaging the gearing. The graving dock is served on one side by a 50-ton crane and on the other by a ten-ton crane. The 50-ton crane is equipped with motors for various duties as follows: main hoist, 50 h.p.; jigger hoist, 50 h.p.; whip hoist, 50 h.p.; jigger rack, 30 h.p.; derrick, 60 h.p.; travel, four motors of 10 h.p. each.

All the cranes except the 10-ton graving dock one were supplied by Messrs. Stothert & Pitt, Ltd., the motors being manufactured by Messrs. Laurence, Scott & Electromotors, Ltd., while the control gear was provided by Messrs. Allen West & Co., Ltd.

The ten-ton crane was supplied by Sir William Arrol & Co., Ltd., and is equipped with the following motors: hoisting, 50 h.p.; derricking, 12.5 h.p.; slewing, 12.5 h.p.; and travelling, 15 h.p. The motors and control gear employed on this crane were supplied by Messrs. Laurence, Scott & Electromotors, Ltd.

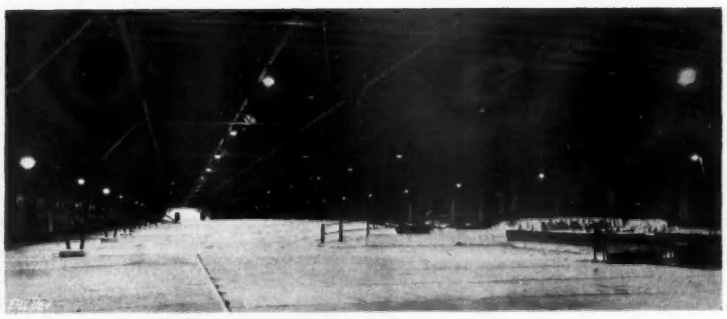
Shed and Outside Lighting

The even and effective lighting of the sheds is highly creditable, for the very large area with comparatively small height presented an unusual problem. Each shed is about 800 ft. long and 150 ft. wide, and is lighted by two rows of 500-W fittings with 45 ft. spacing and in staggered formation at 19 ft. above floor level. An average illumination of 3 ft.-candles is obtained at the working plane, and the special silvered glass G.E.C. reflectors are designed to cut off at 65 deg. from the vertical.

The approach road to the dock is lighted by 1,000-W " Wembley " lanterns mounted on 24-ft. standards at 157 ft. spacing, and the non-axial asymmetric reflectors distribute light across the road at an angle of 160 deg. The railway tracks skirting the sheds are illuminated by G.E.C. non-glare asymmetric reflectors equipped with 500-W lamps mounted 28 ft. above ground and spaced at intervals of 45 ft.

The quays are illuminated by 500-W " Rodalux " fittings made by the Benjamin Electric, Ltd.

At the King George V graving dock there are twenty-two

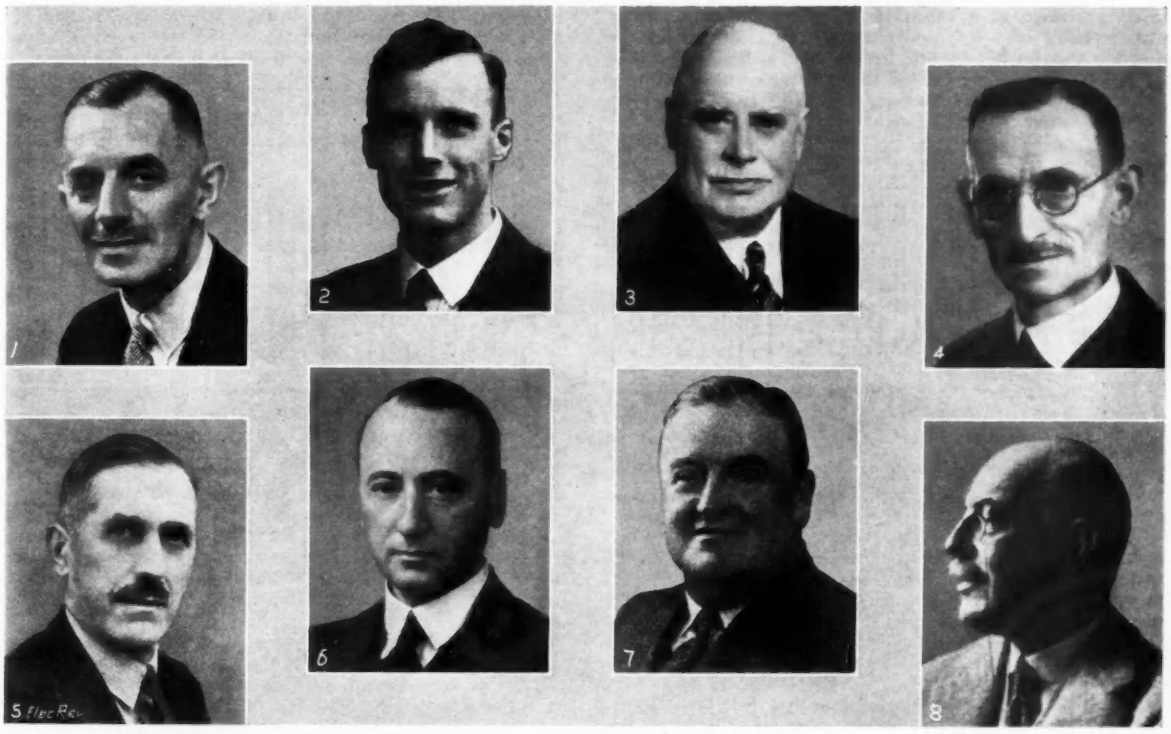


The illumination of one of the cargo sheds

electrically operated sluice valves varying from 3 ft. 6 in. to 10 ft. in diameter. These valves were supplied by Messrs. Glenfield & Kennedy, Ltd., and the motors by Lancashire Dynamo & Crypto, Ltd.

All the quays and sheds are served by rail connections which link them up with the group of marshalling sidings placed landward of the passenger and cargo sheds, and thence to the main line system of the Southern Railway. The general scheme also includes the construction at some future date of a jetty, about 4,500 ft. long and 400 ft. wide, which will run parallel to and 600 ft. from the new quay. This, together with the 7,000 ft. of quay already constructed, will give an additional 15,500 ft. of berthing at the port, and accommodation for about twenty vessels of the largest size.

Some Driving Forces in the Industry: Veritys, Ltd.



1. Mr. C. J. Pitt, works director. 2. Mr. R. Verity, M.A., Sales Dept. 3. Mr. B. C. Evans, Companion I.E.E., chairman. 4. Mr. W. Pipkin, works manager. 5. Mr. A. Lanz, chief designer. 6. Mr. F. W. Thorpe, "Maxlume" industrial lighting and heating. 7. Mr. J. T. Corneille, M.I.Mar.E., director, Marine Dept. 8. Mr. Thos. I'Ons, director, Export Dept.
(Photos. Nos. 1, 4 and 6 by H. J. Whitlock & Sons.)

Tertiary Windings. By B. G. Gates, A.M.I.E.E.

Their uses and ratings

IN its broadest sense, the term "tertiary winding" in a transformer is applicable to a winding additional to the normal primary and secondary windings; it may be entirely separate or auto-connected with one of the main windings, as, for example, where a normal 400-V winding is extended to give a 600-V supply for condensers for power-factor correction. In this article, however, consideration will be given only to the well-known delta- or mesh-connected winding which is employed where the main windings are star connected.

The main function of a tertiary delta winding is the stabilisation of the neutral points of the main windings with regard to both harmonics and fault or unbalanced load currents. When a three-wire, three-phase supply is given to a star-connected bank of transformers or a three-phase unit not fitted with a tertiary delta winding, triple harmonics will be developed in the voltage to neutral. With a bank, these voltages may reach very high values, but tend to a limit with increasing flux density of a little over 50% of the fundamental voltage. Even at low flux densities such as 11,000 to 12,000 lines per sq. cm., these voltages may amount to 35 to 40%.

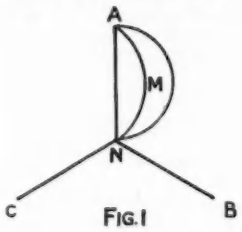


FIG. 1

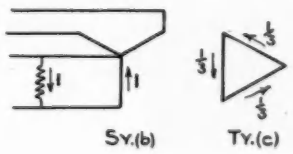


FIG. 2

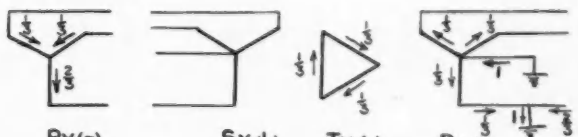


FIG. 3

Taking the limiting case, the r.m.s. voltage to neutral will be increased in the ratio $\sqrt{1+(0.5)^2}=1.12$ or 12% increase, which is sufficient to cause trouble with any lamps connected between line and neutral on the secondary side. At the same time, if the neutral be earthed, serious trouble with telephone interference and sometimes also incorrect operation of protective gear will be produced.

With three-phase, three-leg core-type units, conditions are much less acute owing to there being no closed magnetic path for the circulation of triple-harmonic fluxes, and, as a result, the triple-harmonic voltage seldom exceeds 5% even at the highest flux densities. A number of quite large three-phase core-type transformers with plain star/star connections have been built and, provided that the neutral points are not earthed, they are entirely satisfactory. The three-phase shell type, either of the rectangular or the circular pattern, and the five-leg core type provide a closed magnetic path for triple-harmonic fluxes, and corresponding voltages appear of the same order of magnitude as for a bank of single-phase units.

The effect of these harmonic fluxes is to produce a considerable reduction in the iron losses owing to the depression of the peak flux density, the reduction frequently amounting to 10 or 12%; with three-phase, three-leg core-type units the effect is negligible owing to the low value of the harmonic component.

A further defect of star/star connections is the impossibility of supplying appreciable unbalanced loads between line and neutral without serious displacement of the neutral point, owing to the choking effect of the other phases. For a resistance load between phase A and neutral, the locus of the neutral displacement for various loads is approximately a semi-circle on AN as diameter (fig. 1), while for inductive loads the locus is an arc of a circle (less than a semi-circle) passing through A and N, *e.g.*, AMN.

There are two ways of overcoming the difficulties outlined above; the first, which is really only a partial cure, is to arrange the connections of the secondary winding in zig-zag (or interconnected star, as it is also called). It can be shown that this will suppress the third-harmonic components in the secondary phase voltage and will also permit the supply of unbalanced loads between phase and neutral; on the other hand, it does nothing to prevent the formation of the triple-harmonic fluxes in the core, so that the oscillations of the

primary neutral are unaffected. This connection is very common for small step-down transformers of fairly high primary voltage as a substitute for the common delta-star arrangement, since it permits the use of a star connection for the primary winding, thus leading to considerable economy in design. It should be noted that the use of a zig-zag connection in the primary winding instead of the secondary is quite ineffective, since, although it prevents oscillation of the

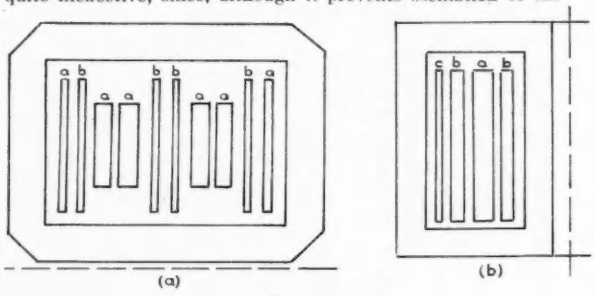


FIG. 4

primary neutral, it does not permit unbalanced four-wire secondary loads, and the third harmonic voltage will still appear in the secondary phase voltage.

Cases sometimes arise in practice where both primary and secondary neutral points are required for earthing, and, at the same time, no phase difference is permissible between the primary and secondary systems. Where this is so, only the second way of overcoming the difficulties mentioned is available, *i.e.*, the use of a tertiary delta winding (with the possible exception of the rarely used zig-zag/zig-zag connection).

The delta-connected winding provides a short-circuited path for triple-harmonic voltages, and, therefore, suppresses them almost entirely in the phase pressures of the main windings. As the resulting currents flowing in the delta are very small, it might be thought that only a very light winding would be necessary. Further consideration shows that this is not the case.

If, for example, an unbalanced load is applied between line and neutral on the secondary side as in fig. 2, currents will flow in the delta as shown; on this basis, therefore, the tertiary delta would have to have a rating equal to $\frac{1}{3}$ of the maximum out-of-balance expected; *e.g.*, for 25% out-of-balance, the rating would be 8⅓% of the main windings. Similarly, if a short-circuit occurs between line and neutral on the secondary side, the tertiary winding will have to carry $\frac{1}{3}$ of the fault kVA. As it is sometimes specified that the tertiary windings must have as great a factor of safety from the thermal point of view as the main windings, it is evident that this require-

Two interesting lighting installations by Messrs. Troughton & Young. Left: Messrs. Stewart & Ardern's showrooms. Right: Quaglino's Restaurant, London, S.W.1

ment will lead to a winding of 33⅓% rating (ignoring the fact that the tertiary winding is initially at a somewhat lower temperature than the main windings). A commoner value is about 15% rating.

If the primary neutral is earthed at the transformer, then a fault between a primary line and earth would lead to the condition shown in fig. 3, where the fault kVA in the primary winding is the same as that in the tertiary winding; the above-mentioned specification would lead under this condition to the use of a tertiary winding of 100%, which would be economically impracticable.

The reactance to fault currents can be shown to be $\frac{2}{3}\times X_{ab}+\frac{1}{3}\times X_{bc}$ for a fault of the type shown in fig. 2, and $\frac{1}{3}\times X_{ca}$ for a fault of the type shown in fig. 3 where X_{ab}, X_{bc}, and X_{ca} are the percentage reactances at full kVA between *ab*, *bc*, *ca*. To reduce fault currents, it is desirable to make the reactance

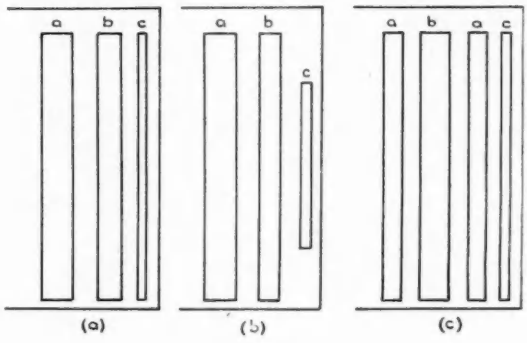


FIG. 5

between the main windings and the tertiary fairly high, since the value of X_{ab} is usually fixed by considerations of the voltage regulation of the system.

In the case of shell-type transformers this can be quite readily done by means of the arrangements of windings shown in fig. 4 (a) and (b) for rectangular and circular types respectively. By this means X_{bc} and X_{ca} can be made of the order of 20 to 30% for ordinary normal values of X_{ab}, *e.g.*, 4 to 10%. The case is not so simple for core-type units. The common arrangement of windings is that shown in fig. 5 (a). With this arrangement $X_{ca}-X_{bc}=X_{ab}$ approximately, and as it is not economically possible to make X_{bc} very high, X_{ca} is not much greater than X_{ab}; typical values would be about $X_{ab}=9\%$, $X_{bc}=4\%$, $X_{ca}=13.5\%$. In order to overcome the danger of the low value of X_{bc}, it has been proposed to use a tertiary winding much shorter in length than the main windings as shown in fig. 5 (b). This will certainly increase X_{ca} and X_{bc}, very considerably without altering X_{ab} but, under short circuit, very large mechanical forces will be produced between the windings due to the unbalanced magnetic conditions existing.

In some very large core-type units it is necessary to interleave the primary and secondary windings as shown in fig. 5 (c) in order to keep X_{ab} down to a reasonable value. Under these conditions, the difficulty with regard to X_{bc} disappears, since the relation given above no longer holds; thus typical values obtainable are $X_{ab}=10\%$, $X_{ca}=25\%$, $X_{bc}=30\%$.

In some cases the tertiary winding is brought to external terminals for the purpose of supplying a load, *e.g.*, synchronous condensers. When this is so, the rating of the tertiary winding is fixed largely by the magnitude of the applied load and it frequently happens when the main and tertiary loads are of widely different power factors that all three windings are of approximately the same rating. In that case no special precaution need be taken. On the other hand, tertiary windings of only small rating, *e.g.*, 10%, are sometimes brought out for the purpose of running local lighting, cooling plant, &c. This practice is extremely dangerous, since although the magnitude of the short-circuit current is limited by the reactance X_{ca} or X_{bc} the effective overload in the copper of the tertiary winding is

$$\frac{100}{X_{ca} \text{ or } X_{bc}} \times \frac{100}{\text{tertiary rating}},$$

and for small windings this amounts to a very high figure, so much so that the time for the copper to reach melting point will be only a fraction of a second, causing the winding almost to explode.

The general conclusions to be drawn from the above notes may be summarised as follows:—

(1) Tertiary windings should be used only where system conditions render it essential.

(2) Their ratings should be fixed in relation to the fault currents expected on the system (a common value is 15% of the rating of the main windings).

(3) They should be used only to supply load when this load is so large that the tertiary winding rating becomes comparable with that of the main windings.

An Up-to-date Café at Chester

Electricity wins on its merits

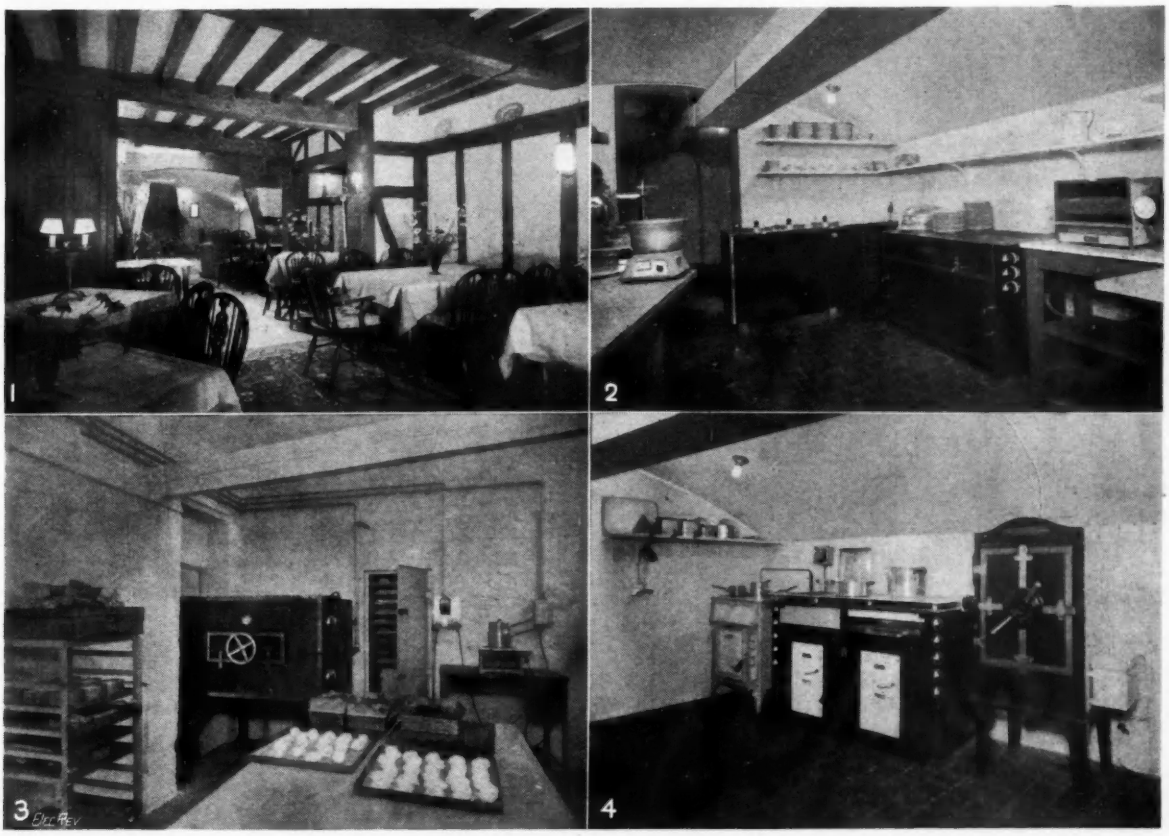
A DINNER, attended by Sir William Ray, M.P., executive chairman of the Electrical Development Association, was given to inaugurate an electric café, called "Quaintways," in Chester on June 8th. It is the first of its kind in the city; the proprietor is Mr. D. Beck, of Chester. The café is constructed in Tudor style, and the electrical apparatus was installed by the Chester Electricity Department. At the dinner Mr. Beck presided, supported by the Mayor of Chester (Mr. C. Sconce), the Sheriff (Ald. F. D. Price), the chairman of the Corporation Electricity Committee (Ald. R. Matthewson), Mr. C. D. Taite, M.I.E.E (Lancashire Power Co.), the Town Clerk of Chester (Mr. J. H. Dickson), Mr. S. E. Britton, city electrical engineer, and others.

The Mayor and Sir William Ray proposed success to the café. Sir William said that he could not help appreciating what an example it was going to set, not only to Chester but also to the promoters of that kind of establishment all over the country. Mr. Beck, in reply, said that his decision to make "Quaintways" electrical was not done without serious attention to every other form of heating, cooking and lighting, and Mr. Britton and his staff had given him valuable assistance in obtaining the necessary data. He had been surprised that it was not possible to get the detailed cost of running various services from the manufacturers. Several letters were written to café proprietors asking for the volume of water consumed in a café accommodating 100 people, but none could say; so, with the advice of Mr. Pritton and his staff, they had put a separate meter on every electrical appliance. Before making "Quaintways" 100 per cent. electrical, he sent questionnaires to twenty-seven caterers. Twenty replies were received, and all were completely satisfied and some were very enthusiastic.

Alderman Matthewson said a good deal of educational work remained to be done in the matter of electricity supply, and a good deal of prejudice had yet to be overcome. Mr. Taite said that as one who made his living by advocating the use of electricity, he would say that Chester had become very well known throughout the country for the enthusiasm which it had put into the development of electricity.

The heating of the café is by means of "Dulrae" panels concealed in the ceiling, but in portions of the café which were considered unsuitable for this, tubular heaters have been installed. All the heating is automatically controlled by thermostats. There are also two 3-kW imitation log fires. The ventilation is controlled by an electric fan which draws the air through vent ducts, and is capable of giving up to twelve air changes per hour.

The kitchen equipment includes a large double-oven range complete with hotplates (23.5 kW) and a single-oven range complete with single superspeed hotplate (9.5 kW). There is also a fish fryer (7 kW), a steamer (5 kW) and a potato peeler. In the still room there is a tea, coffee and milk self-contained still room set (7 kW), a small mixer, a hot cupboard and carving table (6 kW), and a combined ice cream freezer and storage cabinets. A double-door refrigerator is installed adjoining the kitchen. The bakehouse equipment comprises a 10-kW single-deck baking oven, a 12-gallon storage water heater (1 kW), proving oven (2 kW) and a cake mixer, while the staff room has an electric inset fire and a 3-gallon water heater. An electric fire is installed in the manager's office.



The "Quaintways" Café at Chester

(1) A general view of the café. (2) A part of the kitchen. (3) The bakehouse. (4) Some of the cooking equipment.

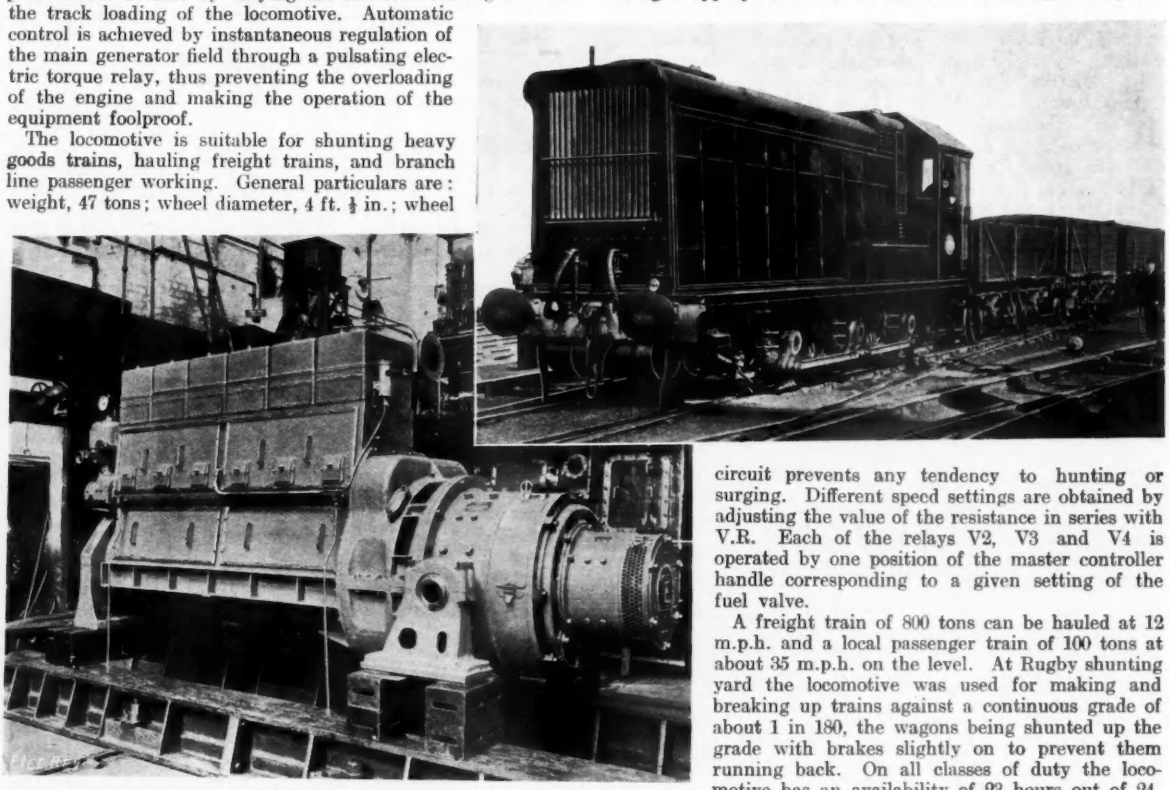
The café is illuminated from Tudor half-lanterns and candle fittings, specially designed. Hot water for kitchen use and other conveniences is supplied from a 300-gallon electric water heater. The unusual character of the premises made it somewhat difficult to find a suitable position for a heater if installed in the usual way. It was decided, therefore, to design a special tank to operate on the constant-temperature principle, and to situate the heater in the staff room adjoining the kitchen, but elevated by one floor. Several unique features are included in the design of the heater and pipe system. The usual removable element flange was dispensed with in favour of a much smaller one of the solid type, access to the heater for inspection being obtained by means of a removable manhole at the top of the cylinder.

The temperature of the water is thermostatically controlled, and indicated by a thermometer fitted in the flow pipe. Provision has been made to prevent a fall of temperature due to mixing by the aid of an electrical device controlling the flow of water. The heater is lagged with granulated cork and housed in a timber container. The pipe work is of copper, and is well insulated against heat loss. The total loading of the equipment installed in the café is no less than 113.6 kW.

A New Diesel-electric Locomotive

A NOVEL feature of the 300 h.p. Diesel-electric locomotive now undergoing trials on the L.M.S. Railway, is the use of electric torque control—its first application in Great Britain. By this system the engine speed is held at a predetermined value by varying the electrical loading to suit the track loading of the locomotive. Automatic control is achieved by instantaneous regulation of the main generator field through a pulsating electric torque relay, thus preventing the overloading of the engine and making the operation of the equipment foolproof.

The locomotive is suitable for shunting heavy goods trains, hauling freight trains, and branch line passenger working. General particulars are: weight, 47 tons; wheel diameter, 4 ft. ½ in.; wheel base, 11 ft. 6 in.; minimum curve, 290 ft. radius; overall length over buffers, 28 ft.; maximum tractive effort, 30,000 lb. It has a single driving cab at one end, sound-insulated from the engine compartment.



Left: The engine at the makers' works. Right: A general view of the locomotive

The six-cylinder English Electric Diesel is of the four-stroke cold-starting type running at 675 r.p.m., with 10-in cylinder bore and 12-in. stroke and two valves per cylinder. It is carried on a three-point suspension and drives a direct-coupled 240-kW generator and an overhung 11-kW generator. The automatic fuel injection valves are operated by pressure of the fuel. Main bearings are lined with white metal.

The E. E. governor gear comprises cylinders solenoid-operated by varying the pressure of the lubricating oil. They are controlled from the driver's cabin, the engine speed being set to a range of predetermined values. Failure of the lubricating oil supply automatically shuts down the engine. The main generator, which is separately excited at 80 V from the auxiliary machine, has a voltage range of from 0 to 640. Both machines comply with B.S.S. 173-1928 with "B" class insulation. The 11-kW generator has a reversed pole for charging the 40-cell lead battery under varying speed and load. The motors can be connected in series or in parallel by standard electro-magnetic contactors; there is a single-step weak-field shunt control for each.

The torque control mechanism consists of a small permanent magnet voltage generator, V.G., driven direct from the engine, a load regulating relay, V.R., and a generator field contactor, G.F.I. The voltage generated by V.G. is directly proportional to the engine speed. The load regulating relay is fitted with a single pair of contacts which open and close with small changes of current in its operating coil, which is in series with an adjustable resistance across V.G. Relay V.R. is set so that when the engine is running at the correct speed, the contacts are on the point of "making" or "breaking"; any departure from this speed is followed by a decided movement of the relay armature, closing the contacts on increase and *vice versa*.

The contacts of V.R. are connected in the operating coil circuits of G.F.I., which opens and closes correspondingly with the former. The contacts of G.F.I. are connected across a resistance which is in series with the main generator shunt field. The intermittent action of the contactor alternately strengthens and weakens the shunt field current, giving an average field strength appropriate to the conditions obtaining. A special circuit prevents any tendency to hunting or surging. Different speed settings are obtained by adjusting the value of the resistance in series with V.R. Each of the relays V2, V3 and V4 is operated by one position of the master controller handle corresponding to a given setting of the fuel valve.

A freight train of 800 tons can be hauled at 12 m.p.h. and a local passenger train of 100 tons at about 35 m.p.h. on the level. At Rugby shunting yard the locomotive was used for making and breaking up trains against a continuous grade of about 1 in 180, the wagons being shunted up the grade with brakes slightly on to prevent them running back. On all classes of duty the locomotive has an availability of 23 hours out of 24, the remaining hour being utilised for refuelling and lubrication. Under average shunting conditions the consumption of fuel averages 3 gallons at 4d. per gallon and of lubricating oil, one pint at 2s. 6d. per gallon, totalling approximately 1s. 3¾d. per hour.

In addition to the vacuum brake, straight and automatic air brakes are provided which enable the locomotive to be used with any type of stock. The vacuum brake can be applied to the train alone without the air brake being applied to the locomotive, and the hand brake can be operated independently or in conjunction with the air brake.

The locomotive was designed and built by the English Electric Co., Ltd., in conjunction with Messrs. Hawthorn, Leslie & Co., who were responsible for the construction of the mechanical parts.

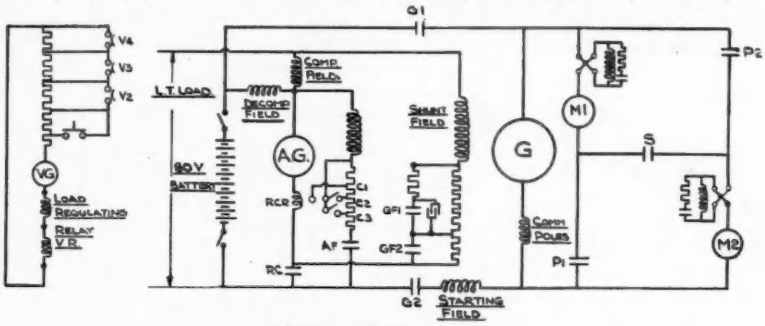


Diagram of connections

London Transport

An interesting handbook bearing this title by Vernon Sommerfield has been issued by the London Passenger Transport Board as a part of its general publicity. It contains a useful survey of the history of passenger transportation in London from the earliest efforts made in this direction. The structure of the Board and particulars of its services are given—Underground, omnibuses, tramways, trolley buses—and there is a reminder that the power to run river services is possessed by the Board. At the end of the book there is a series of pictures which effectively demonstrate the efficiency and modernity of London transport.

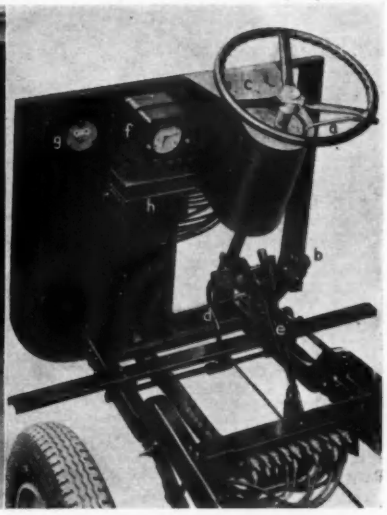
A Town Delivery Van

The Wilson "electric"

WE agree with Mr. H. G. Wilson, managing director of Messrs. Partridge, Wilson & Co., Ltd., that the people who should first employ electric vehicles are electricity supply undertakings. Not only are the vehicles well suited for the delivery work of the progressive undertakings, but their extended use would have a definite and considerable propaganda value, particularly with such a slogan as that adopted by the company—"Forty Miles for 6d."

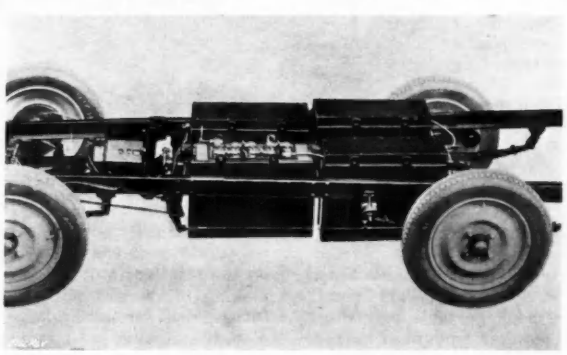
This figure is based on the supply of electricity for battery charging at ¼d. per kWh., and there is already evidence that supply authorities are ready to co-operate to this extent, and even further. True, this definite advantage in running cost is partly offset by higher initial cost, but the substantial economy possible would soon counterbalance this. Besides, like many things, including petrol vehicles, the ultimate price largely depends on the opportunities for mass production.

The Wilson van compares well with the modern automobile



Dashboard equipment and controls
(a) Controller lever; (b) foot switch; (c) safety key switch; (d) foot brake; (e) hand brake; (f) ampere-hour meter; (g) charging socket; (h) main oil switch.

The new Wilson van which we saw in various stages of manufacture recently at Leicester certainly answers doubts as to the practicability of electric vehicles, and during a trial run we were impressed by its simple control, smooth running and effective braking. It is purely a town delivery van, with a maximum capacity of 6 cwt. and a speed up to 20 m.p.h. A basically common chassis, measuring 11 ft. long, with a 6-ft. wheelbase and a 3 ft. 6 in. track, accommodates one of two sizes of Exide-Ironclad traction batteries—96 Ah or 129 Ah—and several types of bodies are available.



Portion of the chassis, showing battery and motor housing

Motor and Transmission

The chassis is constructed of a pressed-steel frame with channel and tubular bracing. At a little less than half its length from the front a Metropolitan-Vickers traction motor is bolted to a pressed steel cross-piece. This motor is notable because of its small dimensions and comparatively low speed, 1,400 r.p.m., and it drives directly, through flexible couplings, a control and longitudinal tubular transmission shaft which serves the rear axle through a bevel differential gearing. The batteries are slung in two rows, one on either side of the transmission shaft. They are covered in and can be lifted out through trap doors.

A row of terminals on a brace in front of the motor and a group at the vehicle front simplify the wiring between the motor and controller, and give accessibility, which is enhanced, *inter alia*, by a removable cover on the vehicle front.

The situation of the steering wheel right forward permits maximum van capacity, and on the steering column is mounted a drum-type controller, which is operated in ordinary automobile fashion by a finger-tip lever. The controller is not q.m. and b., but it carries a separate set of contacts which provide relay operation for the main oil switch.

Three series-parallel combinations of battery connections have been selected for the speeds, and there is an auxiliary (breaker operating) contact for each main connection, the wheel contact, key switch, foot switch and the oil switch auxiliary circuit being in series. The foot switch affords the "immediate" control at starting and stopping, and is depressed while running, but because also of the governing of the main breaker at the drum controller by the auxiliary contacts it is not necessary to remove the foot when changing speed. Final governing is afforded by removal of the key switch.

For battery charging there is a three-pin socket, the third pin of which is in the magnetic circuit of the switch and is governed by a special Sangamo charging meter so that when the battery is charged the switch is automatically opened. This ampere-hour meter indicates the capacity available in the battery and the actual amount consumed, and operates in a reverse direction when the battery is being charged. A fixed red hand indicates "battery empty." The charging meter, main switch and charging socket are all mounted beside the steering wheel on the interior of the dashboard. The vehicle is sold with full lighting equipment, horn, a safety-glass wind screen with an electric wiper, and tools.

By an arrangement with the Chloride Electrical Storage Co., Ltd., the batteries may be rented under a service scheme. For battery charging Messrs. Partridge, Wilson have introduced two static rectifier chargers for garage wall fixing and a.c. operation. Each charger has two s.p. magnetic switches, one on each pole, one acting as an overload unit, while the other operates in conjunction with the ampere-hour meter. An ammeter has three sections, one for equalising (5 A), one for the normal charge (12 A), and one for the boosting charge (25 A). This ammeter is controlled by a rotary output control switch. In the event of a mains failure charging is resumed automatically on reinstatement of the supply.

Copper Shortage in Germany

Reuter (Berlin) reports that owing to the growing scarcity of copper the German raw material control authorities have forbidden the use of copper for high-voltage cables. It is suggested that aluminium shall be used instead as from a technical viewpoint it provides an equally good substitute and can be produced in Germany in quantities to meet any demand.

Glass Vessel Manufacture

Applications of electricity at a Yorkshire works

CONTINUOUS 24-hour day and seven-day week working of the glass melting furnaces results in an excellent load factor which renders glass-vessel manufacture admirably suited to electrical operation, with consequent benefits to both the electricity supplier and the consumer.

During a recent visit to the Headland Glass Works, Knottingley, of Messrs. Jackson Bros. (Knottingley), Ltd., we saw the important electrical applications involved in the production of glass bottles, vases, &c., from a mixture of mainly sand, lime and alkali. The mixture, after being heated to about 1,600 deg. C., and melted in gas-fired furnaces, is partly mechanically and partly pneumatically moulded in automatic machines which turn out the actual product, apart from annealing and certain finishing operations.

Conveyor, mixer and bucket elevator for raw materials and (right) looking into a furnace under repair; solid glass is being dug out

The molten glass is fed into preliminary machine moulds, either by gravity or by suction. A plunger injected into the liquid material first produces a cone-shaped plastic moulding, while at the same time an anchoring ring is formed on the vessel for security during subsequent moulding operations on the revolving-table principle. After the cone is released and the sections of the final mould are closed in around it in jaw-like fashion, compressed air is injected into the preliminary moulding, blowing the plastic material out to the shape of the mould. It is this blowing operation that is so important electrically, for by far the greater part of the electricity consumed is devoted to this purpose. About 70 h.p. is required for each machine, which will produce about 200 gross of bottles per 24 hours.

The actual mechanical operations such as table revolving, mould clamping and cutting off the required amount of molten glass are also effected by compressed air in most of the machines, although we saw some operated electrically; in one instance a three-head machine which produces about 120 gross of bottles per day is equipped with a 4-h.p. motor.

We saw Ingersoll Rand compressors of various sizes each driven, respectively, by a 225-h.p., a 100-h.p., an 80-h.p., and a 60-h.p. Brook motor, and a 100-h.p. "Crypto" motor, all governed by rotor-type starters and oil switches, several of Ellison manufacture. All the motors are three-phase slip-ring induction machines. Mr. Donald Jackson, to whom we are indebted for help in the preparation of these notes, spoke highly of the satisfactory operation of the compressor plant. For producing the vacuum for the suction feed machines electricity is also used extensively, and we saw for this purpose a vacuum pump with an 8-in. diameter cylinder and a 6-in. stroke driven by an 11-h.p. motor. After their removal from the moulding machines the products are placed in annealing furnaces with conveyor bottoms on which gradual cooling off is permitted. The conveyor has an area of about 6 ft. by 90 ft., travels at 45 ft. per hour, and is driven by a 4-h.p motor. A short endless chain arrangement which delivers the mixture of raw materials on to a bucket elevator for feeding the furnaces affords the necessary mixing of the materials, and the whole system, which will deal with 12,000 lb. of material per hour, is driven by 57 h.p. of motors. From a purely engineering point of view, perhaps, the machine shop is of greatest interest, for moulds are produced to very fine limits of accuracy and the modern lathes, &c., are all driven electrically. While it would probably be foolish at this stage to suggest firing the furnaces electrically with so crude a form of heat and so high a temperature, it would be equally foolish not to keep an eye on the idea for future development. Electric furnace work is making big strides, so as an indication of a possible future furnace load for the Yorkshire Electric Power Co., which supplies the factory, we mention that 350 tons of coal per week are used for gas production for firing the furnaces. The power company affords a duplicate supply to the factory at 11,000 V and the pressure is transformed down to 400 V 3-phase by outdoor equipment in a sub-station on site.

Some Scientific Exhibits

THE customary display of scientific apparatus at the Institution of Civil Engineers on the occasion of the annual conversazione on June 13th included a semi-automatic light distribution photometer which has been devised in the G.E.C. Research Laboratories. The light given off at various angles by the lamp reflector being investigated falls on a photo-cell connected to a galvanometer. Rotating in unison with the movable arm carrying the photo-cell is a paper disc on which the galvanometer spot light moves about according to the amount of light received by the photo-cell. By following the spot light on the paper disc the polar distribution curve of the lamp reflector can be traced.

For recording the stresses formed in reinforced concrete piles while they are being driven by impact the Building Research Station employs piezo-electric crystals embedded in the concrete pile to actuate a cathode-ray oscillograph. Similarly the Admiralty Department of Scientific Research is using tourmaline crystals in association with an oscillograph to investigate the effects of under-water explosions.

The Admiralty Engineering Laboratory, West Drayton, exhibited an air-flow meter which utilises the principle of measuring a small displacement by the change in the magnetic constants of two inductive circuits. The instrument consists essentially of two iron-cored coils in a cylindrical box, the magnetic circuit of the coils being completed through an air gap and a movable iron armature connected by a spindle to two thin brass diaphragms which close the two ends of the cylinder. This transmitter is placed in the air stream.

When air is flowing the diaphragms yield in the direction

(Continued at foot of opposite page.)

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The Kilowatt Charge

Why should the kilowatt charge be based upon the maximum demand during the winter months? The answer at first sight is because the lighting and heating loads attain their maximum at that time. The grid, for example, has to provide sufficient plant and mains in advance to take care of the forthcoming winter load, and interest on capital has to be paid. I am not sure, however, that the load levelling effect of diversity, where, as in the grid, there is a large network covering a wide area with a large proportion of industrial load, is fully appreciated.

One reason given for high standing charges is that electricity cannot be stored, but the grid network does, to a certain extent, take the place of a storage battery. It enables the takings from the "swings" and the "roundabouts" to be set off against each other. There was a question some time ago, for example, as to whether provision for taking care of snap demands caused by sudden fog should be made by the grid or by the individual electricity undertakings, and it was decided that the latter should carry the risk, which, of course, means that they must charge the consumers enough to cover it.

This, in my opinion, is wrong, for fogs are usually fairly local, and as their effect, so far as the grid is concerned, is negligible, the grid should take the risk. But my main question is whether there is any particular virtue in taking a statutory year, and the winter part of it at that, for the purpose of fixing the standing charge not only as between the grid and the undertaking but between the undertaking and its consumers.

ENFANT TERRIBLE.

June 15th.

Elementary Engineering Science

In the review of my book, "First Year Engineering Science," which appeared in your issue of May 18th, complaint is made that pin-jointed frames are dealt with in ten lines; your reviewer has counted the lines correctly but he has failed to realise that these ten lines form but a paragraph in a chapter of twelve pages dealing with various systems of forces, and since this is an elementary or first-year textbook, only simple types of pin-jointed frames can be dealt with, and so ten lines with examples in addition are sufficient.

Your reviewer states that "in one or two of the diagrams some correction is necessary to the sense of the vectors"; I suggest that to impute an error without specifying it is hardly fair criticism.

It almost looks as though your reviewer is himself in a tangle as to what constitutes a magnetic material. Allow me to quote from Prof. Jeans ("Magnetism and Electricity") who says: "It appears probable that all substances possess some power of magnetic induction . . . ," also from Prof. Silvanus Thompson who says: "all that the equatorial pointing of a body proves then, is, that it is less magnetic than the material which fills the surrounding space." I think that this should clear up any "tangle" in your reviewer's mind and prove to him that magnesium, copper and bismuth are slightly magnetic materials. This being an elementary textbook I have, of course, not entered into a discussion of diamagnetic, paramagnetic and ferromagnetic materials.

Your reviewer is very hard to please: when I merely mention vibration and string galvanometers I have gone too far; on the other hand, when I fail to write a treatise on friction I have not gone far enough in spite of the fact that I have defined solid friction, rolling friction, boundary friction and fluid friction; explained the principle of the Michell bearing; and, for an ordinary cylindrical bearing, marked the areas where the pressure is (1) a maximum and (2) a minimum, &c.

If your reviewer will take the trouble to re-read my book, and if he can realise the type of student for whom it is intended and the conditions under which these students work, it is possible that he may revise his opinion.

Prescot, *June 9th.* GEO. W. BIRD.

In his book Mr. Bird has merely *defined* various kinds of friction, from which the student learns nothing about *friction*, the physical fact. He does not, for instance, know why a bearing is usually formed between two dissimilar materials or why if the metals are separated by an oil film there should be any friction at all.

Reference to a vibration galvanometer in a book in which a.c. is not mentioned is confusing. If the string galvanometer had been quoted as an example for demonstrating the force on a current-carrying conductor in a magnetic field it might have been excusable even in an "elementary textbook," but merely to say that it is "very sensitive and accurate but requires careful handling" does not err on the side of either accuracy or lucidity.

Chinese coolies unloading five miles of submarine cable supplied by W. T. Henley's Telegraph Works Co., Ltd., to the Chinese Government

The author is insistent that this is an elementary textbook, but if one of his elementary students wonders why copper, magnesium and bismuth are classified as magnetic substances he is to read Jeans. A piece of copper freely suspended in a magnetic field will probably behave like a feebly ferromagnetic substance, but when freed of ferromagnetic impurity the purified copper (or better still a piece of bismuth) will set itself equatorially and not axially in the field. How is the student to be satisfied about this *negative* susceptibility without getting into a "tangle"? Would it not have been better to have confined the list entirely to ferromagnetic substances

Some Scientific Exhibits (*continued from the previous page*)

of the air flow and cause a small displacement of the iron armature, so changing the inductance of both coils, one increasing due to the shortening of its air gap and the other decreasing due to the lengthening of its air gap. The change in inductance upsets the balance of an a.c. bridge, the amount of "out of balance" being recorded on a detector calibrated to measure the air velocity in the region of the transmitter. The detector (or indicator) is of the permanent-magnet moving coil type supplied through a full wave copper-oxide rectifier.

The Telegraph Construction & Maintenance Co., Ltd., displayed a model of its Greenwich works; sections of the original Anglo-French submarine cable laid in 1850; and a specimen length of the latest cross-Channel cable laid last year in which twenty-eight circuits are maintained.

Mr. Olaf F. Block's collection of Ilford infra-red photographs included specimens which clearly indicated overheated parts of machinery and the directions in which heat rays are emitted by an electric fire. By courtesy of Bristol University the electrical recording extensiometer, devised by Mr. F. de La C. Chard, was on view.

For measuring the evolution of heat in concrete while it is settling, Mr. Norman Davey uses interior and exterior thermocouples connected in opposition to a galvanometer whose spot-light actuates a photo-cell controlling circuit. It is thus made possible when building dams to select concrete which will not generate high temperatures that might cause the concrete to crack when hardening.

The "Metrovick" portable noise-measuring apparatus operates on the principle of aural comparison of the complex noise under observation with a pure reference tone of fixed frequency and adjustable amplitude. Mr. John L. Hodgson showed an air meter which he devised for use in the Mersey Tunnel in conjunction with local indicators, transmitter, and distant recorders. Movement of a carefully balanced disc in the air stream causes a slider to vary the resistance of a constant voltage instrument circuit.

Mr. R. P. Fraser's investigations into the mechanism of explosions have shown, amongst other things, that when rapidly burning gas is caused to travel in a tube it moves along in the form of a spiral rotating at very high speed. By subjecting this spiral to the influence of an intense electric field it has been possible to stop the combustion.

and not have confused the elementary student by including substances whose characteristics are not dealt with?

For nearly forty years I have been in very close association with students of this type, and I have regretfully seen a steady decline in mental quality brought about by the pernicious system of syllabus, examination and textbook. I am "hard to please" because I want teachers to realise what fundamental principles really are, and to teach and write about them regardless of examination results—to teach the student *to think from first principles* and not to learn tables of "useful

The showroom of the Manchester depôt of the Revo Electric Co., Ltd., which serves the Northern area

formulæ" in order to obtain a paper qualification which entirely misrepresents his ability. The student will then surely be able to assimilate and develop his subject and become a contributor to engineering progress.

The textbooks on fundamental principles written by the great teachers of my early days have been allowed to become obsolete because they are no good for passing examinations. Recently in the technical Press an engineer of some standing drew attention to a book on alternating currents which was unorthodox, and therefore but little known or used for teaching, although it is probably one of the most illuminating elementary treatments of the subject ever offered. Still more recently the author of a book on electricity which came very nearly to my ideal felt compelled to state in his preface that it was *useless for passing examinations.*

Mr. Bird throws some light on the matter when he tells us that ten lines on pin-jointed frames *with examples* is sufficient. Presumably it is the facility to work examples which counts; there is not time to explain what a pin-jointed frame really is any more than there is to explain friction.

June 18th. YOUR REVIEWER.

Dangerous Wiring Methods

The letters on this subject remind me of my short but interesting experience as engineer and manager to the electricity undertaking for a municipality in the Near East. The supply in that town was formerly in the hands of a private owner whose primary object was to make as much money as possible. Although his supply was supposed to be 220 V d.c. it seldom, if ever, exceeded 170 V, with a pronounced blink in the lights.

When the Municipality took over the system was changed over to three-phase, four-wire and it became very necessary to make some hundreds of inspections and insulation tests. In the course of my inspections I found no main switches or d.p. fuses; all wiring was 1/.044, whether for one or twenty lights; tee joints were unlimited, taped and untaped; v.i.r. leads passing from room to room were either taken through cracks of windows or door frames and in some cases holes were drilled in marble door lintels, window frames or pieces were even cut out of the doors.

In the so-called bathroom, a kind of cupboard 4 ft. square with a stone floor, one could stand under the shower and easily reach the switch controlling the light. The circuits were generally cotton-covered flex and the switch covers metal; in fact certain death lurked in those bathrooms and rewiring was imperative.

The cost per point averaged about 4s. 6d., and this included a conical opal shade and lamp, but if the work was let to "electrical engineers" from the bazaar it could be carried out for 3s. 6d. per point; in both cases the material used was cheap Japanese or German, and the wiremen's rate of pay ranged from 2s. to 4s. per day. I endeavoured to raise the standard of work by introducing a registration scheme and stipulating that service connections would be made only to work that had been carried out by registered contractors. In a short time considerable improvement was noticed; the contractors were willing to comply with our simple regulations, and in fact pleased to be educated in the way of doing a decent job.

In this country licences might be issued through the National Register of Electrical Installation Contractors; the supply authorities would then be assured that the work complied with their requirements. If on the other hand the supply authorities carry out wiring installations then the onus of doing a good job at a fair rate is on them. I am sure that an amicable arrangement could be arrived at to stop unqualified ironmongers, plumbers and wireless merchants from carrying out electrical installations. The foregoing would have the effect of stopping a very large amount of jerry wiring that is going on at the present time on a large number of housing schemes, and incidentally the building societies and insurance companies could take a hand in what is a serious matter. The latter could do a lot towards stamping out bad electrical work by refusing to take the risk until electrical installations had been tested by a duly qualified electrical engineer. Cinema installations have to be tested annually by a qualified man before the annual licence is issued by the local authorities. In some of the houses being built on various housing estates around London (£1 down and balance as rent) I have recently seen some of the most appalling work being carried out by boy labour on piece work rates. Lead-covered wires are fixed to wooden joints with bent nails; bare v.i.r. passes through brick courses without any protection, and ends of conduit are left rough after being cut with a hacksaw, and in no place did I see conduit ends finished with bushes; this is the kind of work accepted by the building societies' surveyors.

During the last month or so there have been three fatal accidents from 230-V a.c. circuits. In two cases death was caused by the work of amateur electricians; the third death was due to a defective piece of apparatus. I, like many others, agree with Mr. Moss that compulsory registration is very necessary and a long time overdue. C. F. PALLOT, A.M.I.E.E.

Harrow, *June 16th.*

Surely correspondents writing under this heading are exaggerating the dangers. It has been my experience—in other countries I hasten to add—that for ordinary residential wiring for lighting purposes almost any sort of installation suffices when the object of safety only is regarded. Attention need only be given to copper capacity, fusing, pushing the lampholders out of the way so that lamp-changing necessitates a chair, and the use of bakelite switches. The wiring itself may be of v.i.r., uncleated if cost is a consideration, provided it is placed well out of reach.

The only potential source of danger in residential installation is in domestic appliances and portable lamps, and this should be overcome in their design as far as is practicable. It is not advisable to rely for their protection through the medium of the wiring, such as earthing of outer casings by connecting them to conduits or sheathing of lead-covered cable.

If one is not rule-bound it is difficult to justify the condemnation of a house installation where the v.i.r. is often without cleats and hardly distinguishable from the cobwebs which abound and obviously installed in ignorance of any wiring regulations when one is aware of many hundreds of similar installations of twenty to thirty years' standing which have caused no fire or other inconveniences.

This apparently national perspective of wiring methods undoubtedly is one of the contributory reasons for the larger use made of electricity for house lighting in some other countries, where people earning much less than our so-called "working men" can afford one, two or more lighting points without the help of assisted-wiring schemes. T. WILLIAMS.

June 16th.

The Canadian Electrical Industry

The writer of "Notes from Canada" appearing in the ELECTRICAL REVIEW of May 4th, is misleading in the appeal that he makes to British manufacturers. He seems to wish to offset the apparently almost overwhelming influence of the United States in the electrical manufacturing industry of Canada. While admitting that Canada manufactures no small quantity of electrical goods, which serves her own home market, he says that she still imports from the United States large quantities of electrical equipment, which might be imported from Great Britain. Further, he throws his hands up at the failure of British manufacturers of electrical equipment to show at the Canadian National Exhibition and fears that "finis" is to be written across the historical record of the Canadian electrical market, as far as Great Britain is concerned. May I reply to these points?

The "overwhelming influence of the United States" is a bogy which is raked up here very frequently. To your correspondent it is something that must be eradicated at all costs.

In the first place there is a feeling abroad that Canada is only an assembly plant for goods made in the United States. While this may have applied to certain industries in the past, it certainly does not apply to the electrical industry. If it did, the electrical industry would not be able to show a capitalisation of $102,979,896 (149 companies) and a production value of $104,577,790.

It is quite true that certain companies are affiliated with companies in the United States, either through agreements or through stock ownership, but that may also be said of certain companies engaged in the manufacture of electrical equipment in Canada that are affiliated with British companies. The real value of any industry to Canada, or any country, is the work it provides for its people. I am sure your correspondent's fears might be justified if all the people employed by these industries lived in the United States and merely moved over to Canada to work in the daytime, and then spent their money in the United States. But can it be said that, for example, an electrical concern that in thirty years has grown from a small manufacturing plant, employing 100 people, to its present size, normally employing 5,000 people, has not added very materially to the general prosperity of Canada?

Your correspondent may possibly be disturbed by the relation that exists between some Canadian companies and American companies, whereby patents and research are shared. It should be understood, though, that the Canadian industry does not differ from manufacturers of electrical equipment in other countries, as there is a wide degree of co-operation among British, French, German and American companies.

The second point raised by your correspondent is that Canada manufactures no small quantity of electrical goods to serve her home market, and even furnishes exports as well, but that the value of imports from the United States is still very large, at least in normal times. Referring to figures previously quoted, the production value of the electrical industry of Canada in 1930 was $104,577,790. The Canadian exports were $2,521,045. This proves a 98 per cent. absorption of a home industry, which is indeed very satisfactory.

Great Britain imported more electrical equipment from the United States in 1931 than she did in 1930, whereas Canada imported less by nearly $10,000,000 during that period. On examining the type of electrical equipment Great Britain imported from the United States of America it is shown that to a large degree it is similar to that which the United States exports to Canada, *i.e.*, motors (small), refrigerators, radio sets and parts, vacuum cleaners, special testing equipment, &c.

Since the end of 1931 the manufacture of domestic electric refrigerators has been so developed in Canada that none is now imported.

Let Great Britain supply Canada with more of the machine tools which in the past have been obtained either from the United States or from Germany. Great Britain has the rest of the world for her market: why should she export materials that directly conflict with the Canadian manufactur?

As an Englishman who has adopted Canada as his home nothing would have pleased me more than to find English firms in Canada, but instead I find well-established Canadian firms here manufacturing electrical goods for a home market that is peculiarly different from that of any other country.

Hamilton, Ont., *May 26th.* JOHN A. M. GALILEE.

What is Ohm's Law?

Ohm's law is a law of the electric circuit. It is not a statement of the properties of any class of materials. Therefore to say that a material "does not obey Ohm's law" is meaningless, strictly speaking. To say that the resistance of a material changes with current density, voltage, gradient, frequency, &c., is intelligible.

As to the neon tube, it would be a good thing if a competent authority would describe the properties of a neon tube in terms comprehensible to the average engineer, which would explain its peculiar behaviour—considered as a conductor—under both continuous and alternating voltages.

Streatham, S.W.16, *June 17th.* HENRY M. SAYERS.

Institution Membership

We who are members (in whatever grade) of the Institution may not always agree with the decisions of the Council, but we realise (or ought to) that there are things known to them which are not known to us, and we abide by their rulings.

I nearly always find that the people who complain most about the Institution are those who are simply out for the letters to put after their names and are not interested in the aims and ideals of the I.E.E. Sometimes they get in but they never attend meetings, take no part in the activities of their centres, and ignore all correspondence. It is a waste of paper and postage to circularise them and, as they continue to complain, the I.E.E. is better off without them. GRADUATE.

June 18th.

The E.C.A. Conference

THE ninth annual conference of the E.C.A. Allied Associations opens at Buxton on Wednesday next. The organisers are once more to be congratulated on their choice of meeting place; those who do not know Buxton will gain some idea of the beauties of the district from the accompanying views.

The proceedings proper commence on Wednesday evening with the president's reception at the Palace Hotel, followed by a dance. On the next morning the delegates will be welcomed by the Mayor at the Opera House, and Mr. Orringe, the president, will then deliver his address. Following this, Sir William Ray, M.P., will give an address which is to be discussed the same afternoon.

There will be a smoking concert at the Palace Hotel on Thursday evening.

The annual general meeting will be held at the Opera House on Friday morning.

Later, Mr. H. Marryat, the new president, will take office and deliver a short address.

After luncheon, delegates will motor to Bakewell to inspect the works of the D.P. Battery Co., Ltd., at the invitation of Mr. H. M. Drake. The evening will be devoted to a ball and supper given by the Mayor at the Spa Hotel.

Above: A general view of Buxton. Left: The Pavilion Gardens and bowling green. Right: The Gardens from another angle.
(Photos. by J. R. Board.)

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Unorthodox Cooker Design

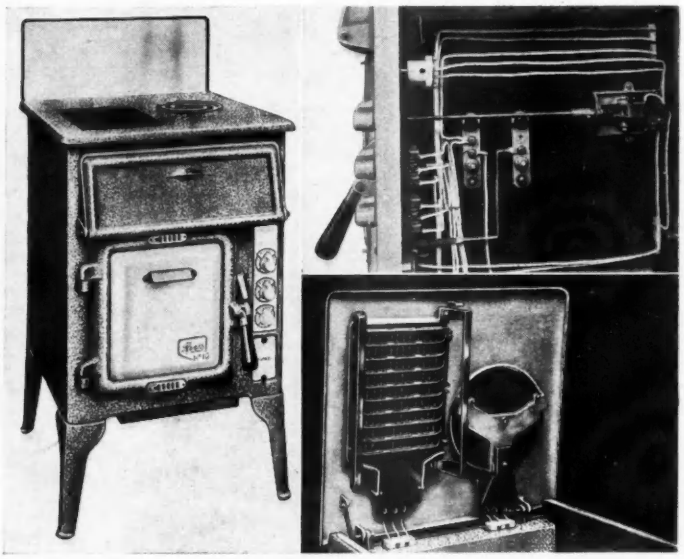
The new No. 10 Revo cooker, introduced at the I.M.E.A. Convention exhibition, embodies several unusual features. The "Autotherm" oven heat regulator, which can be supplied to maintain a predetermined temperature in the oven by automatically switching the current on and off, also functions as the hand-operated oven switch. It is operated by a special expanding metal rod projecting inside an oven which is large enough to cook a 14-lb. turkey or a 9-lb. joint of beef and pie and Yorkshire pudding.

Detachable elements with a combined loading of 1½ kW are fitted top and bottom, and a series of oven rack slides pressed out of the oven sides obviates the need for separate runners and prevents the racks from tilting, the corrugated oven sides being in one piece. The oven measures 11½ in. high by 11½ in. wide by 12½ in. deep and all corners are rounded. The fuses are accommodated at the front of the cooker under the switches, and are easily accessible after the removal of the cover plate.

The hob assembly is of unusual design inasmuch as the supporting cradles and fixing lugs for both hot-plate and grill boiler are integral with the hob, and are very easily assembled and adjusted. Even the grill pan slides are attached to the grill boiler. All connections and wiring are adequately shielded but are instantly accessible when the hob is raised.

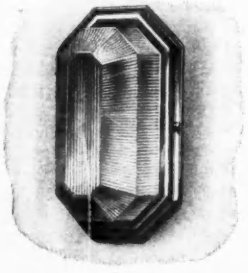
The overall dimensions are 34½ in. high, by 20½ in. wide by 21 in. deep, and the total loading 5.5 kW with enclosed plates. The hot cupboard, which is heated by the grill boiler, measures 5 in. high by 16½ in. wide by 15½ in. deep: standard equipment includes a 10 in. by 7 in. 2.2-kW enclosed boiler-griller and an 8-in. diameter 1.8-kW enclosed boiling plate, although a "Superspeed" griller or boiling-plate can also be obtained for £4 extra.

The price of the cooker, finished in mottled grey, non-staining, non-cracking vitreous enamel, is £10, or £10 18s. 6d. with the automatic oven temperature regulator. An oven thermometer and low splashplate are also obtainable as extras, each costing 10s., from the manufacturers, the REVO ELECTRIC CO., LTD., Tipton, Staffs.



The Revo No. 10 cooker: (left) fitted with a "Superspeed" boiling plate; (right above) a view of the switch wiring showing the "Autotherm" temperature controller; and (below) the unusual hob assembly with a "Superspeed" boiler-griller in position

The "Prismalux" Fitting



The "Prismalux" lighting fitting

A semi-recessed unit has been designed by the WARDLE ENGINEERING CO., LTD., Old Trafford, Manchester, 16, for use in situations where a minimum projection is desirable. The glass front embraces almost the whole lamp, which is backed by a stainless mirror. The prisms, moulded in the inner surface of the glass, diffuse the light, the front panel spreading the beam in the horizontal plane. The cover is secured by screws.

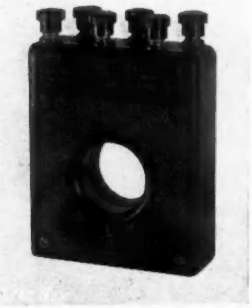
The "Prismalux" is suitable for one 60-W lamp, but units fitted with two lampholders can be supplied for use in buildings where emergency lighting equipment is installed. Standard finish is green cellulose enamel, and the list price is 15s. 6d.

A Portable Speech Amplifier

Portable speech-amplifying equipment for addressing large audiences in the open or in large halls is now obtainable for £28 complete from the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. The outfit is readily transportable in three units by one man and is self contained, the "Class B" amplifier being battery operated. The microphone is mounted on a telescopic stand and the permanent-magnet moving-coil loud speaker has a 42-in. projector horn. A collapsible speaker tripod stand costs 50s. extra.

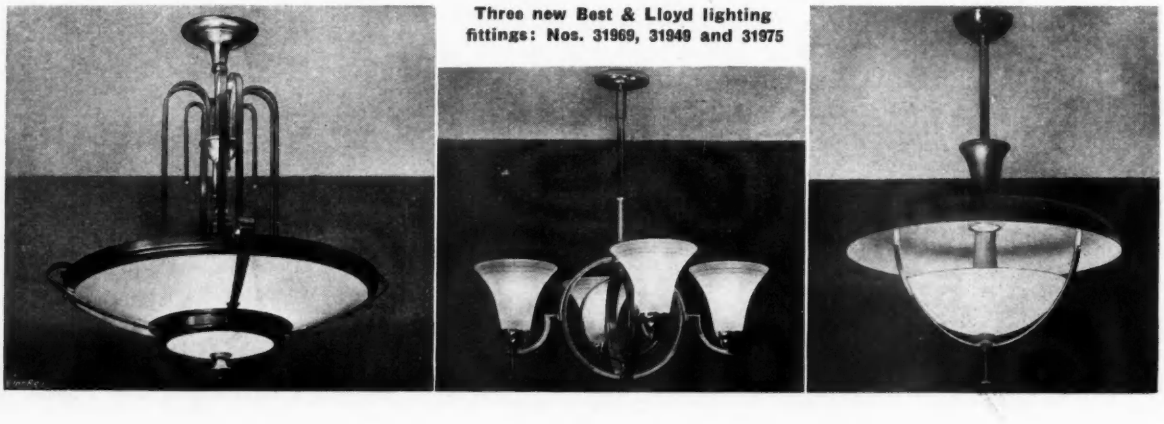
A Miniature Testing Outfit

A miniature current transformer and ammeter developed by MESSRS. ELLIOTT BROS. (LONDON), LTD., Century Works, S.E.13, is designed to comply with B.S.S. No. 89 for first grade moving-iron instruments. Seven ranges are available to measure 0.5 A (with accurate readings at 50 mA) to 200 A. The transformer has three self-contained primary windings for 2.5, 10 and 25A, but the range can be increased by winding a conductor in the requisite number of turns through a central aperture, 1.375 in. in diameter. The secondary current is 0.5 A, and the rated burden is 2 VA with any frequency from 50 to 150 cycles, though the set is applicable to frequencies as low as 20. Insulation is suitable for voltages up to 750 V. The transformer may be adjusted for use with a wattmeter to measure watts at 50 cycles, if the burden does not exceed 2 VA.



The Elliott testing outfit

The ammeter, which has a sector scale length of 2.375 in., gives full deflection for 0.5 A without the transformer, and under these conditions will give d.c. readings with reasonable accuracy as the moving and fixed alloy are treated to avoid hysteresis errors. The total weight of the outfit, excluding leads and transport case, is



Three new Best & Lloyd lighting fittings: Nos. 31969, 31949 and 31975

1 lb. 10 oz., and the price is £4 10s. A leather transport case costs 13s. 6d. extra, and the current transformer can be supplied separately for £4.

A Leakage Detector

A very small electrical leakage, given suitable conditions, can cause a serious fire. To prevent this happening ELECTRICAL LEAKAGE DETECTORS, LTD., 68, Victoria Street, S.W.1, are manufacturing a small detector which, it is claimed, will indicate a leak of 1 mA. It measures 8¼ in. by 5 in. by 3¼ in., weighs approximately 1¾ lb., and is adaptable for either wall or panel mounting.

The "Eidel" electrical leakage detector

The casing is made of bakelite, being resistant to damp or weather conditions, and warning of electrical leakage is given by a red glow showing through a glass-covered aperture about 1¼ in. in diameter. A selector switch is fitted so that the instrument may be set (whilst in action) to function at any desired value of leakage. A push button is also fitted so that the instrument itself may be tested at any time, the illumination of the neon tube indicating that the detector is in order. The instrument is sold at 4 gns., completely sealed, the internal parts being solidly sunk in bitumen so that they cannot be tampered with.

The "Radome" Steam Trap

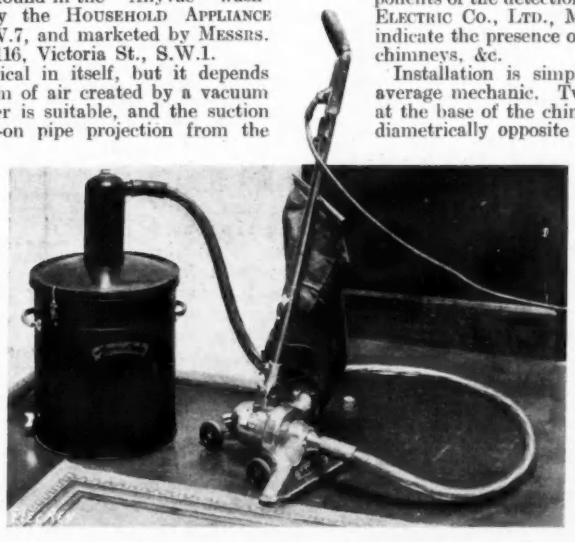
A new steam trap introduced by MESSRS. HOLDEN & BROOKE, LTD., Sirius Works, Manchester, 12, is known as the "Radome." It is designed for use on radiators, and is of simple design based on the inverted principle, and the chief advantages claimed are that it has a positive action, is light and compact and compares favourably in price with the expansion type.

The body and cover are of cast iron, and the float is made of copper, while the valve and seat are made of stainless steel. At a pressure of 30 lb. (max.) the capacity is 350 lb. per hour. The trap weighs 6¼ lb. and measures 5¼ in. high, 4½ in. in diameter, and 4½ in. across the branches. Tappings for either ½ or ¾ in. can be provided.

An Externally Operated Washer

An extension of the principle of electric washing by which air is drawn through the water and clothes to create turbulence and provide oxygen, is found in the "Anyvac" washing machine introduced by the HOUSEHOLD APPLIANCE Co., 85, Cromwell Road, S.W.7, and marketed by MESSRS. R. G. DIXON & Co., LTD., 116, Victoria St., S.W.1.

The machine is non-electrical in itself, but it depends for its operation on a stream of air created by a vacuum cleaner. Any type of cleaner is suitable, and the suction hose is secured to the slip-on pipe projection from the central chamber above the cover. This chamber communicates with the interior of the washer *via* a thick felt pad held between the conical outer and inner cover pieces. Attached to the outside of the main body are two pockets which are open at the top and communicate with the container by means of holes at the bottom below the water level. Hence, with the cleaner running, air is drawn into the container at the bottom from the pockets, through the water and clothes and discharged at the top through the felt pad filter, which is mentioned above, so that no moisture or dirt can get through the cleaner and damage it.



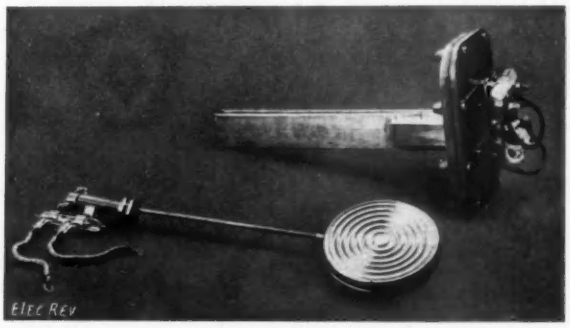
The "Anyvac" washer in operation

A valve at the top of the air chamber can be regulated to receive air direct from the outside, so that the actual air-stream pressure through the water and clothes can be controlled according to the power of the vacuum cleaner. The consumption is, of course, that of the vacuum cleaner, and the attractively finished machine is sold at 5 guineas without the vacuum cleaner.

An Automatic Immerser and Float Switch

Two recent developments by MESSRS. C. H. BLACKBURN & Co., 2, Sandland Street, W.C.1, are a new automatic immersion heater suitable for any form of water-heating equipment and an improved form of the company's float control switch. Both are marketed under the trade name "Stellex."

Very fine temperature control, with an operation tolerance of only one degree F., and unusually compact construction for the combination of the heater proper and the thermostat, affording very simple one-hole fixing, are the outstanding features of the immersion equipment. The heater and the thermostat are of the blade and bi-metal types, respectively, and the thermostat is pocketed at the end of the blade, close



The "Stellex" automatic immersion heater and float control switch

up to the external head of the unit and immediately inside the tank, and is actually attached to the surface of the blade. The thermostat operates a mercury switch in the heater head, and the switch control is such that only a part of the heating element, still under thermostat control, need be left in circuit to maintain a predetermined temperature.

The switch is direct acting and it will deal with both a.c. and d.c. loads up to 40 A. The heater is made in sizes up to 20 in. long, with loadings up to 10 kW. Front and back flanges with 1 in. to 2½ in. standard threads simplify fixing, and the head does not need unscrewing to obtain access.

The principle improvement in the float control switch is that the metal bellows at the end of the float rod and outside the tank does not lose its flexibility under severe conditions of temperature, pressure, &c. One end of the bellows is open and gland-secured to the tank, and to the other closed and "floating" end is internally attached the end of the air-ball rod. Vertical movement of the float therefore results in proportional movement of the free end of the bellows, with consequent tilting of the mercury switch which is clamped to it.

Smoke Detection and Recording

A simple amplifier, suitable for operating from all usual electric supply mains, containing a photo-cell, valve, and relay, together with a suitable light source, comprise the essential components of the detection equipment designed by the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2, to indicate the presence of smoke in factory and power station chimneys, &c.

Installation is simple and can be carried out by any average mechanic. Two small holes are made in the wall at the base of the chimney, about 2 in. in diameter and at diametrically opposite points. The two units are mounted on suitable iron brackets, one on each side of the shaft, so that light from the lamp is projected through the chimney on to the photo-cell in the amplifier on the opposite side. This simple arrangement dispenses with such troublesome accessories as glass windows in the shaft, which become fouled very quickly. The cover of the amplifier is fitted with an adjustable iris diaphragm to enable the engineer in charge to set the point at which the alarm comes into operation after he has decided exactly what may be considered as objectionable smoke, a decision which may be influenced to some extent by local conditions.

The alarm bell could be supplemented by red and green lamps to indicate which boiler is producing smoke. To obtain a daily record of the times at which excessive smoking occurs and the length of each period a chart on a clockwork drum is mounted in a glass-panelled case from which it can be easily removed for examination. The pen arm carries an armature moved by an electro-magnet excited from the alarm circuit and thus has two positions, "smoke" and "no smoke."

By the addition of a filter to make the beam of light invisible, this equipment has also been installed for the purpose of automatically ringing a bell in the office and switching on the lights in the establishment when a motor car enters a service station or garage.

A Wireless Relay Switch

We have examined a sample of a new radio relay switch sent to us by HENDERSON'S WHOLESALE ELECTRICAL & RADIO, LTD., Electric House, Queen's Road, Brighton. It consists of

a bakelite box having three plug entries for giving alternative programmes. One and three are for the alternative programmes, the middle one being made at the moment to keep the plug when it is out of action. When not in use four of the sockets are covered by a shield, which slides along, revealing two at a time. The pattern has, however, been arranged so that in the event of three circuit programmes being required it could be altered accordingly. The switches are supplied without the shorting bars, as these are used in various ways by different relay firms. Shorting bars and suitable fuses can be supplied separately. The sockets are for standard 5-A gauge. Two discs allow the screws to be sealed to prevent their being tampered with by subscribers. The price is 2s. 6d. (trade only).

A radio relay switch

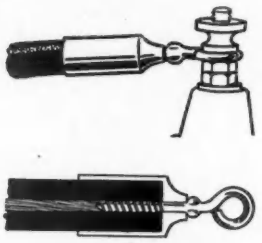
A Leda Table Refrigerator

A new table service refrigerator with an internal capacity of 11½ cu. ft. has been introduced by the LEDA ELECTRIC, LTD., Oldham Road, Miles Platting, Manchester, 10, for cafés, clubs, dairies, &c. The top is of a convenient height for use as a table and is made of vitreous-enamelled steel. The actual refrigerating machine can be placed 30 ft. away from the cabinet.

The cooling coil is fitted with three 1-lb. ice drawers, and temperature control is automatic, eight freezing speeds being available. The exterior dimensions are 3 ft. 6 in. wide by 2 ft. deep by 3 ft. high, and the exterior is panelled with figured oak ply, white enamelled or grained and varnished. The insulation is 2 in. compressed corkboard, and the interior is lined with stipple glazed asbestos sheeting. There is a shelf area of 15½ sq. ft.

Automobile High-tension Terminals

The "Paragon" terminal has been introduced by MESSRS. CLARKES (REDDITCH), LTD., Sinew Works, Redditch, for use on motor cycles, cars, lorries and aeroplanes, &c. The accompanying drawing illustrates the method of fitting the terminal sleeve over the end of the high-tension lead and shows how the screw penetrates actually into the current-carrying part of the cable.



The method of fixing the "Paragon" h.t. terminal

The projections on the side of the screw prevent it from going too far in, and the sleeve acts as a compressor to the covering composition when the screw is being driven into the cable core; thus no stripping of the insulation is necessary. Various sizes and types from 5 mm. to 11 mm. in diameter are available.

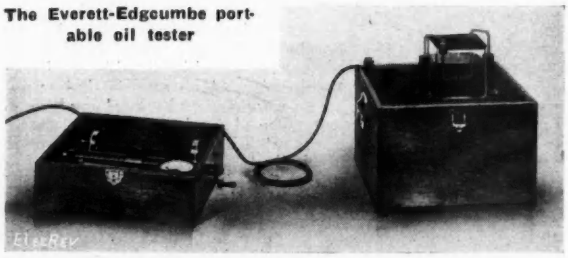
A New Portable Oil-testing Equipment

DIRECTIONS for the periodical testing of the insulating oil used in transformers and circuit-breakers are given in British Standard Specification No. 148, as recently revised, but the size and cost of high-voltage transforming, regulating, and measuring gear have rendered such tests difficult and expensive. Messrs. Everett, Edgcumbe & Co. have produced an instrument to overcome these difficulties.

The "Dielectrimeter" (in which a high-voltage spark coil, fed by an accumulator, generated the testing voltage), although portable, gave only relative results and did not purport to comply with the requirements of B.S.S. No. 148. The Everett-Edgcumbe portable oil tester has been designed to remove these limitations, whilst still retaining portability. The equipment, which operates from any a.c. supply, comprises a 40-kW (r.m.s.) testing transformer, with dry insulation, regulating resistance, voltmeter, and oil-testing vessel, the whole being contained in a strong oak case measuring only 12 by 15 by 14½ in.

Breakdown depends primarily upon the peak voltage of the wave, but is influenced by the wave-form. Care has therefore been taken to ensure that the wave-form shall be as nearly sinusoidal as possible. The inclusion of the adjustable resistor or choke in the primary is considered unsatisfactory, since it tends to give a sinusoidal magnetising current and, consequently, a very distorted secondary voltage. In the new oil tester the transformer core is not saturated until well above the maximum of 40 kV. Moreover, the voltage regulation is effected by connecting the primary across

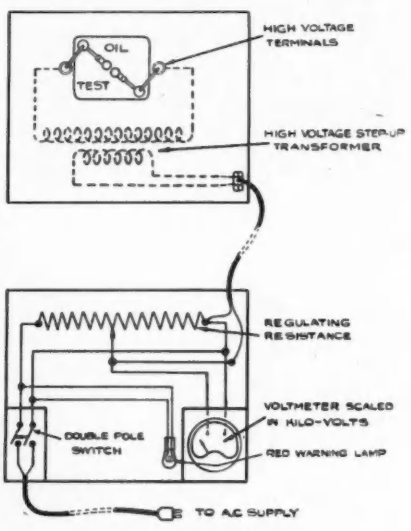
The Everett-Edgcumbe portable oil tester



a continuously variable "potentiometer" resistor, operated by a hand wheel accessible from outside the case, which makes the form factor of the voltage wave closely that of a sine wave at all secondary voltages. The voltage is measured by a voltmeter connected across the primary and scaled in secondary volts from 0-40 kV.

The Test Cell

The test cell likewise embodies several novel features. The spherical electrodes are ½ in. in diameter (as recommended in B.S.S. No. 148) and are removable with the insulating cover, thus leaving the glass container entirely clear. This arrangement prevents oil leakage and facilitates the cleaning and drying of the test vessel. In order to give maximum creeping distance between the h.v. terminals, and to minimise the dimensions of the test cell, the supporting stems are set diagonally. The lid of the case is removable and contains the regulating resistor, voltmeter and double-pole switch in the primary circuit. The l.v. portions of the equipment can thus be separated from the h.v. parts; since the regulation and measurement of the first voltage are carried out entirely from the l.v. unit, all the h.v. parts can be placed at a distance or screened from the operator. The gap setting is that recommended in B.S.S. No. 148 (*i.e.*, 4 mm.), and a gauge ensures that the setting is correctly maintained. The specified test voltage which an oil must withstand for one minute is 30 kV, but the transformer will give a maximum of 40 kV. Should a still more stringent test be required, the gap may be reduced so as to increase the voltage employed for the test to the equivalent of 60 kV across a 4-mm. gap.



Method of connecting up

That its small size and portability do not prevent its giving results equivalent to those of large permanent equipments is indicated by tests on three oils conducted by an independent authority on three permanent equipments: (1) a standard 10-kVA, 100-kV oil-testing plant; (2) a 250-kVA, 200-kV plant belonging to a large supply company; and (3) the Everett Edgcumbe portable oil tester. The first oil gave 39.75 kV as a mean of the measurements with the two standard equipments and 40-kV with the portable tester, the second oil 28.5 and 28-kV, and the third 19.75 and 20 kV, respectively. The last sample of oil was damp and contained traces of suspended fibrous impurities, and with all three equipments showed preliminary sparking at from 10 to 13 kV.

Hire Service Schemes. By F. D. Parker

Points which attract consumers

HIRE-SERVICE development is becoming increasingly important to the up-to-date supply undertaking. Not only are such schemes invaluable for load building, but they also provide a satisfactory solution, if not the only solution, to many of the potential consumers' difficulties.

At present the high initial cost of many of the larger domestic electrical appliances would prohibit their use in many homes if apparatus could be secured only by direct purchase. Even in many instances where capital is available, householders are often reluctant to purchase large appliances, when naturally apprehensive and doubtful concerning their efficiency and usefulness. The transitory nature of the design of domestic apparatus such as cookers is a further deterrent to direct purchase, as such appliances may become rapidly out of date within a few years and therefore costly to repair.

Hire service obviates many of these difficulties. Appliances may be obtained, utilised, and, if considered unsatisfactory, returned without any appreciable loss of capital. Consumers who acquire their apparatus under such schemes also know that the supply authority, in its own interests, will maintain the appliances reasonably up to date and in good condition, and that no charges will be made for repairs in normal circumstances. As supply authorities can usually obtain appliances at a cost considerably less than the ordinary retail figure, this benefit can, in some measure, be passed on to the consumer in the shape of low rental charges.

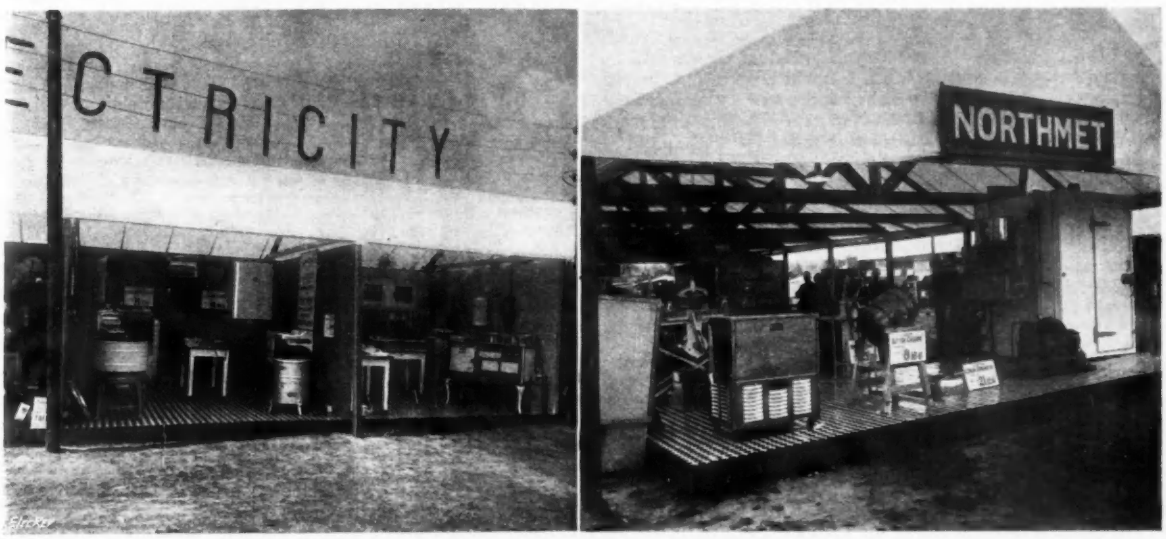
All-in Charge Desirable

The equitable costing and charging of such schemes presents considerable difficulty. The initial costs of apparatus, service and maintenance, depreciation, &c., are not readily and accurately coupled under one rental charge. The cost of consumers' additional wiring has further to be considered. Many schemes have been evolved to deal with the problem. Some supply undertakings make a separate charge, either direct or on a rental basis for each of a consumer's requirements. For instance, a consumer who desires a cooker may be asked to pay 5s. per quarter cooker rental and 2s. 6d. per quarter for the hire of the additional wiring and switches. Alternatively, the consumer may be obliged to purchase the latter outright. Further appliances are hired individually under separate agreements.

It would appear to be more psychologically correct and far simpler always to reduce the numbers of such surcharges to a minimum. Often they are a source of annoyance and misunderstanding—especially if they relate to something from which the consumer appears to derive no direct benefit. Restrictions and initial payments are also best avoided. In the above case the charge would be better fixed at 7s. 6d. per quarter, together with free wiring up to a certain limit. Although there is actually no difference from the supply authority's point of view, the average consumer naturally considers such a system the better bargain and more attractive.

The incorporation of hire charges in the fixed part of two-part tariffs appears particularly feasible. Experience has proved this to be the case among small consumers. The fixed charge is more palatable as it is considered not essentially a component part of the tariff, but for the hire and maintenance of the apparatus.

The practice of coupling cookers and water heaters under one rental charge, together with specially reduced tariffs during the summer months, has proved its value in some localities. In summer when no space heating is required the consumer can enjoy all the benefits of an all-electric house, as the kitchen range need not be used for water-heating purposes. Such arrangements often greatly add to the attractiveness of hire schemes, and materially contribute to their success. There is no reason why this idea should not be further explored. When furniture hire and hire-purchase schemes are advertised, individual charges are not fixed for each piece of furniture. Instead they are charged for collectively under one agreement and simplicity is the result. Moreover, the dealer usually offers his customers a choice of different colours and designs to suit any desired decorative scheme.



Exhibits of the North Metropolitan Electric Power Supply Co. at the Great Hertfordshire Agricultural Show **(See page 915)**

Besides advertising individual appliances for simple hire and charging for them separately, combinations of appliances such as would be suitable for kitchens and bathrooms, &c., could also be made available. The rentals could be in accordance with consumers' requirements, and the appliances and wiring arranged and matched accordingly. Such schemes would materially assist in obviating the growing tendency of consumers to utilise electricity only partially, and would further justify the cost of the additional wiring.

Due to the increasing popularity of smaller houses and flats, kitchens are gradually being transformed and utilised as living rooms for the purposes of meals. Housewives are therefore becoming more insistent on satisfactory colour schemes in these rooms. Much the same applies to bathrooms; striking departures are now being made in the colouring of baths and tiling. Consumers therefore often evince as much interest in the appearance of appliances, especially cookers and water heaters, as in their actual efficiency and operation. A choice of different designs and colours should therefore be given if possible.

Service and Maintenance

Efficient service and maintenance of apparatus on simple hire contributes as much to the success of such schemes as do the appliances themselves. As faults generally occur when apparatus is in use, prompt service is essential. Systematic inspection and testing is also very desirable as it invariably saves the consumer much inconvenience and sometimes repair costs can be materially reduced as faults and any undue deterioration can often be detected and repaired before appliances actually fail in operation. This is especially pronounced in the case of worn out and burnt iron and kettle connection flex and terminals, oven plates and loose cooker switches. Such visits also reassure the consumer that the supply authority is interested in the satisfactory operation of the appliances and intends to maintain them in good order. If the consumer is satisfied he can be canvassed for further apparatus.

The utilisation of three-heat switching for enclosed-type hot plates, &c., further justifies periodical inspection. A break in one of the elements of such apparatus is not readily detected by new consumers unless an occasion occurs when the hot

plate is switched directly on to the low heat position. Usually the tendency is to switch directly to the high heat position which gives medium heat if the element is faulty. When the heat is reduced to low and the plate begins to cool off, newcomers invariably conclude that the heat is not sufficient and revert to the high or medium positions. Hot plates are often condemned as unsatisfactory on account of undiscovered faults of this nature. A portable ammeter inserted in the fuse circuit of such apparatus readily reveals this type of fault.

Nothing is more convincing to prospective consumers than practical experiments. The expediency of this procedure has been substantially proved by the success of the practical electric cooking courses which have been so far arranged. On the other hand, nothing is more disconcerting to the consumer than to find apparatus costly and unsatisfactory in use. As the latter varies considerably with the skill of the user, arrangements for a demonstration in the consumer's home should be made when new cookers are hired. If the consumption of electricity as indicated by the accounts of such consumers suggests that the apparatus is not being reasonably utilised inquiries and further demonstrations could be made.

Manufacturers are now seriously considering the omission of cooker sub-circuit fuses. This step should not be taken without much deliberation. The saving in capital cost per cooker is definitely attractive, and now that open-type hot plates are becoming less extensively utilised there is a measure of justification in their omission. Alternately, the fact that sub-circuit fusing often saves consumers from entire cooker failures is not to be lightly ignored. Modern element construction and design ensures long life and minimises risk of failure to earth. This, however, does not justify the conception that sub-circuit fuses are obsolete and useless. Element failures resulting from open circuits often cause such fuses to blow under prolonged arcing.

Those undertakings which maintain a 24-hour service could afford the luxury of dispensing with sub-circuit fusing on small cookers provided faults are attended to immediately. In other cases, especially in rural districts, these fuses should be retained for the consumers' benefit.

British Overseas Electrical Trade

SO far as the exports of electrical goods were concerned, May was a good month. The Board of Trade returns show that the total was £846,771, which was £42,650 more than in May, 1933. The principal increase was recorded for insulated wires and cables, while motors, convertors and transformers, and switch and control gear were also well up.

There was, however, a considerable fall in the telegraph and telephone section. Submarine cables made one of their periodical dives, declining in value by £29,186, and telegraph and telephone apparatus exports were lower by £39,798. There was also a substantial reduction in the exports of electric generators (£31,151).

The analysis by markets shows that the main improvement occurred in the Australian trade, which increased in value by £27,854. The exports of machinery are seen from the table to have been responsible for the bulk of the increase in the total in spite of the decline in generator shipments. A curious feature of the figures is the item of £1 for electric motors credited to Russia—a decrease of £13,526.

The principal destinations of the more important items shown in the smaller table were as follows, the May, 1933, figures being given in parentheses:—

Rubber-insulated wires and cables: South Africa, £15,196 (£14,078); India, £17,631 (£12,917); Australia, £16,289 (£11,625); New Zealand, £3,141 (£2,244); other British countries, £7,707 (£7,574); foreign countries, £6,024 (£5,596).

Electric wires and cables (insulation other than rubber): South Africa, £14,612 (£12,887); India, £17,062 (£8,657); Australia, £18,709 (£7,255); other British countries, £8,326 (£6,905); foreign countries, £8,858 (£6,489).

Telegraph and telephone apparatus (not radio): South Africa, £29,200 (£46,794); Australia, £6,729 (£4,466); Canada, £815 (£630); other British countries, £11,154 (£17,240); Argentina, £4,309 (£1,911); other foreign countries, £24,569 (£45,533).

There was a remarkable rise in electrical imports—in fact the value was practically double that recorded in May last year, and only one item showed a decrease. This rise appears to have been due mainly to imports of insulated wires and cables—an item which was very small in May, 1933. Substantial increases were also shown against radio apparatus and unenumerated goods. Vacuum cleaner purchases were also larger.

The sources of imports of electrical goods and apparatus were as follows:—

British countries, £19,009 (£7,100); Germany, £62,187 (£51,396); Netherlands, £44,642 (£25,831); Belgium, £21,009 (£8,269); France, £12,781 (£9,217); Switzerland, £15,353 (£11,224); Austria, £8,704 (£4,011); United States, £90,992 (£22,388); other foreign countries, £30,196 (£15,708).

Vacuum cleaners were supplied by the following:—Canada, £5,489 (£5,866); Sweden, £1,757 (£3,143); Germany, £692 (£710); United States, £5,362 (£1,375); other foreign countries, £15,258 (£14,056).

EXPORTS & IMPORTS DURING MAY

	Exports. May, 1934.	Exports. Inc. or dec. compared with May, 1933.	Imports. May, 1934.	Imports. Inc. or dec. compared with May, 1933.
Submarine telegraph and telephone cables	£139	− £29,186	*	—
Telegraph and telephone wires and cables (not submarine)	23,823	+ 220	*	—
Other insulated wires and cables	133,555	+ 37,328	£26,137	+ £8,827
Radio receivers (excluding valves)	19,856	− 1,057	60,242	+ 57,066
Radio transmitters (excluding valves)	5,448	− 6,465	*	—
Radio valves	24,449	+ 437	29,769	+ 25,679
Other radio parts and accessories	29,770	+ 4 975	41,936	+ 20,221
Telegraph and telephone apparatus (other than radio)	76,776	− 39,798	*	—
Electric carbons	*	—	15,612	+ 4,705
Incandescent lamps	45,599	+ 8,145	20,418	+ 4,823
Other lighting apparatus	30,893	+ 8,330	23,770	− 44
Primary batteries	18,787	+ 1,939	615	+ 160
Accumulators	50,528	+ 12,022	*	—
House service meters	8,983	+ 1,612	*	—
Other electrical instruments	16,497	+ 1,868	27,006	+ 9,179
Unenumerated electrical goods and apparatus	103,094	+ 1,080	59,368	+ 21,513
Electric generators up to 200 kW	11,953	− 3,107	*	—
Electric generators over 200 kW	18,957	− 28,044	*	—
Electric motors	89,560	+ 27,117	17,674†	+ 6,710
Convertors and transformers	41,168	+ 19,288	*	—
Starting and controlling gear for motors	30,116	+ 12,687	*	—
Switchgear	56,197	+ 11,613	*	—
Other electrical machinery	10,643	+ 1,637	15,394	+ 5,373
Electric vacuum cleaners	*	—	15,970	+ 4,090
Totals	£846,771	+ £42,650	£353,911	+ £168,902

* Not classified separately. † Not railway and tramway motors.

BRITISH ELECTRICAL EXPORTS DURING MAY

Destination.	Goods and apparatus, May, 1934.	Inc. or dec. compared with May, 1933.	Electric generators, May, 1934.	Inc. or dec. compared with May, 1933.	Motors, May, 1934.	Inc. or dec. compared with May, 1933.	Other electrical machinery, May, 1934.	Inc. or dec. compared with May, 1933.
Irish Free State	£19,443	+ £1,104	*	—	*	—	*	—
Union of South Africa	116,488	− 13,672	£7,842	+ £6,635	£26,726	+ £16,382	£32,132	+ £7,508
British India	86,128	+ 21,024	12,290	+ 9,781	12,350	+ 806	29,604	+ 6,684
British Malaya	14,405	+ 7,372	*	—	*	—	2,817	+ 1,227
Ceylon	4,041	+ 30	*	—	*	—	*	—
Hong Kong	5,026	− 11,459	*	—	*	—	*	—
Australia	77,768	+ 23,896	2,470	+ 1,656	4,149	+ 576	5,134	+ 1,726
New Zealand	26,125	− 3,761	*	—	1,760	+ 367	3,286	− 1,863
Canada	4,820	+ 455	154	− 8,961	3,702	+ 3,043	2,500	+ 638
Other British Countries	35,881	− 1,029	3,658	+ 146	10,337	+ 5,420	16,189	+ 3,009
Sweden	13,597	+ 8,743	*	—	*	—	*	—
Denmark	13,999	− 18,692	*	—	*	—	*	—
Belgium	9,050	− 481	*	—	*	—	*	—
France	10,916	− 16,947	*	—	*	—	1,970	− 3,980
Spain	4,915	+ 2,453	*	—	*	—	*	—
Italy	2,941	− 9,197	*	—	*	—	*	—
Greece	9,633	+ 5,996	*	—	*	—	*	—
Egypt	6 316	− 8,662	*	—	*	—	6,635	+ 5,417
China	10,750	+ 825	*	—	*	—	3,668	+ 2,344
United States	5,032	+ 2,005	*	—	*	—	*	—
Argentina	17,340	+ 5,523	*	—	1,083	+ 232	569	− 299
Soviet Union	*	—	—	− 1,422	1	− 13,526	721	− 987
Netherlands	*	—	80	− 146	*	—	4,567	+ 3,456
Other Foreign Countries	93,583	+ 5,933	4,396	− 38,840	29,452	+ 15,429	28,332	+ 20,345
Total	£588,197	+ £1,459	£30,890	− £31,151	£89,560	+ £27,117	£138,124	+ £45,225

* Not classified separately

New Books

Elements of Radio Communication. By J. H. MORECROFT. 2nd edition. Pp. 297; figs. 241. London: Chapman & Hall, Ltd. Price 18s. 6d.

The recent death of Mr. John Morecroft has robbed the student of radio communication of one of the outstanding exponents of the subject. His "Elements of Radio Communication" first appeared five years ago, and in this edition sufficient new material has been added to bring the text up to date, while a certain amount of matter which is now of interest only from the historical point of view has been omitted. The "Principles of Radio Communication," by the same author, the latest edition of which was recently reviewed in this journal, has for long been recognised as a standard text-book in this country as well as in the United States, and the "Elements" forms really an introduction to the larger volume, although it is complete in itself.

The book is an excellent up-to-date introduction to the practice of radio communication, viewed particularly from the broadcasting aspect. The mathematics is simple, and no previous knowledge of electricity is assumed. The first hundred pages are devoted to the laws of electric circuits, especially radio circuits; the second hundred pages deal with valves and the general principles of communication; and the remainder of the book outlines the detailed arrangements used for the transmission and reception of radiotelegraphy and radiotelephony.

A large number of illustrated problems, with answers, inserted throughout the text should prove of the greatest value to student and teacher alike, and at the end there is another useful set of problems, without answers, for each chapter. The text is clear and concise, and the figures excellent and well placed with reference to the text.

Electric Arc and Oxy-acetylene Welding. By E. ARTHUR ATKINS. Pp. 350; figs. 151. London: Sir Isaac Pitman and Sons, Ltd. Price 7s. 6d.

The second edition of this work comes out at a very opportune time, having regard to the attention which British engineers are now giving to the varied problems associated with welding. Remarkable progress has been made in the technique and applications of fusion welding during the last few years, and Mr. Atkins's book gives the results of numerous tests and investigational work and incorporates many practical suggestions. A feature of the new edition is the inclusion of a well-written chapter dealing mainly with the training of welders.

The author refers to the many valuable publications issued by the Factory Department of the Home Office relating to safety precautions, the regulations drawn up by the Institute of Welding Engineers and the British Acetylene Association on the use of calcium carbide, the many publications of the British Standards Institution, and the regulations covering electric welding operations in the building and repairing of ships which appear in the British Corporation Register of Shipping and Aircraft as well as in Lloyd's Register of Shipping.

The engineering industry is now reaping the benefit of extensive research work. The Essen Exhibition and Conference of July, 1933, gave a unique opportunity of becoming acquainted with recent developments in welding technique in Germany. The Jaunowitzbrücke railway station of the Berlin Metropolitan Railway was erected by welding processes, and recently the halls of the Schöneberg Station were completely welded, and many other welding constructional works are in progress. In England, steel constructional work appears to be in the transitional stage from riveting to welding, and some progress has been recorded in this direction, one example of which, the Tees Bridge, was described recently.

Mr. Atkins's book discusses the whole subject of fusion-welding practice in all its aspects, with the ease and tolerance of the expert; his method is clear, concise, and modern in outlook, providing an enlightening review of current welding processes summarising the newer knowledge in a very readable manner.

A Philosophy of Life. By LLEWELYN B. ATKINSON. Pp. 32. London, Hodder and Stoughton, Ltd. Price 1s.

This is a reprint of Mr. Atkinson's Rankin Lecture. In it the author sets out in a simple and straightforward manner his ordered views on making the most of life. He emphasises the importance of planning out one's life in all its aspects, pointing out that education in the academic sense is only a beginning, and quoting Goethe, "The world is a grand book from which to become wiser." The reader will find thoroughly common-sense suggestions on choice of occupation, aims in life, the use of leisure, health and the more mystical side of living. We hope that the experiences of a man who has himself made a success of life, both as an engineer and an administrator, will be widely read by the younger members of our profession.

* * *

Shorter Notices

We have received the 1933-34 edition of the "Official Municipal Year Book for South Africa (pp. 545), edited by Mr. W. P. M. Henderson, former town clerk of Durban, and Mr. Francis G. Pay, Capetown. With the growth of engineering and electrical enterprise in South Africa, the particulars in this section are very much more comprehensive than those published previously. Data relative to municipalities and local bodies has been revised and the comparative statistics relating to finance, population, tramway undertakings, water supply, electric light, engineering data and motor transport are dealt with in such a manner as to form a comprehensive reference to the whole of South Africa. The book is published at 25s., and the London agents are Messrs. E. G. Allen and Son, Ltd., London.

"Accumulator Charging—Maintenance and Repair," by W. S. Ibbetson. Fourth edition. Pp. 136; figs. 36. London: Sir I. Pitman & Sons, Ltd. Price 3s. 6d.

"A Textbook of Applied Hydraulics," by H. Addison. Pp. 430; figs. 317. Price 21s. "Television—Theory and Practice," by J. H. Reyner. Pp. 196; figs. 88. Price 12s. 6d. London: Chapman & Hall.

Parliamentary News (BY OUR SPECIAL REPORTER)

THE Select Committee of the House of Commons on Unopposed Bills met on June 14th to deal with three Bills confirming Orders granted by the Ministry of Transport authorising the running of railless trolley vehicles. Capt. R. B. Bourne presided. The undertakings dealt with were those of the Southend Corporation, St. Helens Corporation, and Mexborough and Swinton Traction Co. The Committee was informed that the St. Helens Corporation, which already operates nine and a half miles of trolley vehicle routes, proposed to introduce an additional eight miles of route. At Southend an additional route of three miles, now partly a light railway, was proposed. Objections on the part of some residents that amenities would be interfered with had been overruled by the Ministry.

All the Bills were ordered to be reported to the House for third reading.

A Breakdown at Blackheath

On June 13th Mr. Thorne asked the Minister of Transport whether he had received a report from his inspectors relative to the inconvenience caused to the hospitals in the Blackheath area when the electricity supply failed for a number of hours on the previous Sunday night; if he was aware that the hospitals had no electric light for three hours; and if he could state the cause of the breakdown.

Mr. Stanley said he was informed that the breakdown was due to a fault on an old distributor which had been in service for many years; that the principal inconvenience was suffered by the Herbert Hospital; and that the Hospital had now been connected to a new ring main which the company was laying to provide additional security of supply and which was on the point of completion when the breakdown occurred.

Clyde Valley Charges

On June 13th Mr. Kirkwood asked the Minister of Transport if he was aware of the dissatisfaction among electricity consumers in the Clyde area at the higher charges of the Clyde Valley Electrical Power Co. in comparison with the charges of the Glasgow Electricity Department; whether he would order a public inquiry with a view to having the company's charges reduced to the same level as the municipal service; and, further, in view of the Glasgow Housing Committee's official report, showing that householders supplied by the company had to pay from 27s. to almost £3 per annum more than householders on the municipal service for the same supply, would he consider taking steps to bring the whole of the electricity supply in the area under municipal control?

Mr. Stanley said he had recently received a petition from certain residents in Springboig stating that the charges made by the Clyde Valley Electrical Power Co. in that district were greater than those obtaining in the area of supply of the Glasgow Corporation, and asking that the former charges should be arranged on a more equitable basis. The petition was receiving consideration.

"Pylons" and Aircraft

On June 13th Mr. Temple Morris asked the Under-Secretary of State for Air if he would state what steps were being taken to prevent the extension of "pylons" throughout the country affecting the safety of aeroplanes when flying, or being forced to fly, at low altitudes; and whether he was satisfied that the markings on such pylons were of a nature to warn aviators of their existence in the vicinity.

Sir P. Sassoon said that every endeavour was made to avoid the erection of pylons near aerodromes, or possible sites for aerodromes, where the danger to aircraft would be most acute, and diversion of the proposed routes for overhead lines had in many cases been arranged on this account. The devising of suitable methods for warning aircraft of the existence of pylons raised a number of involved technical issues, and the whole problem was still under investigation.

Business and Industrial Notes

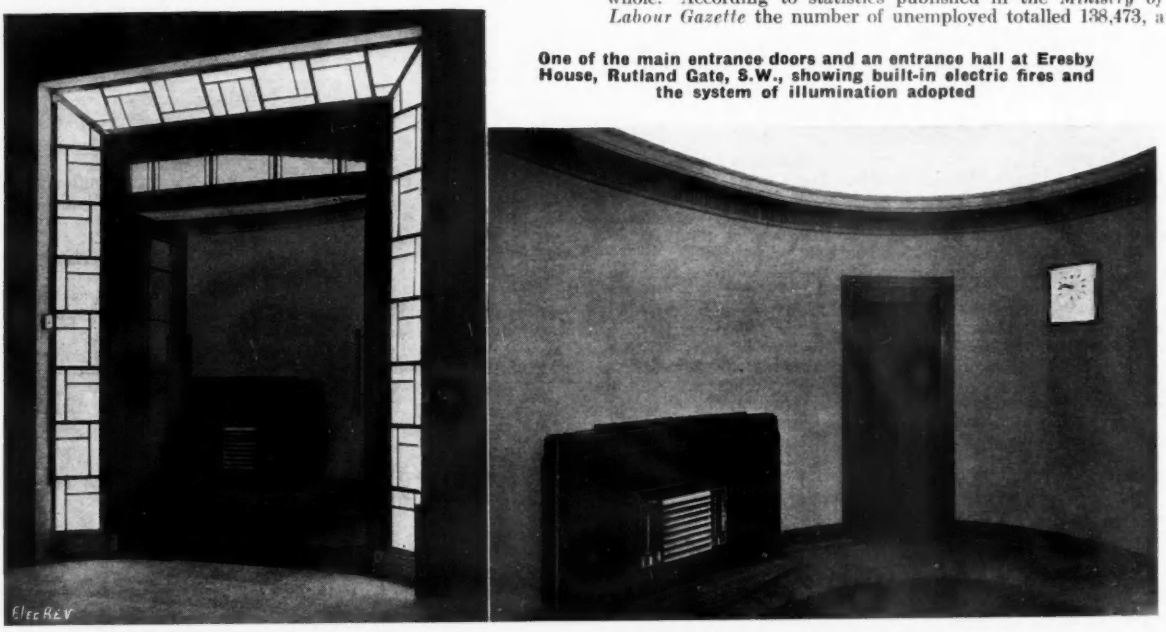
The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Standard Switchgear, Ltd.

This company of Hornchurch, Essex, is extending its operations and adding to its directorate. In addition to its present switchgear products and several new designs thereof which are being developed, it is introducing several new domestic lines, which will involve increased output from the works. The capital has lately been increased and Messrs. J. A. & C. G. Collis, sons of the present technical director, Mr. A. G. Collis, have been elected to the board of directors. Their portraits will be found in our "Personal" section to-day.

Electrical Installation in West End Flats

An interesting electrical installation has recently been completed at Eresby House, Rutland Gate, S.W. This building consists of fifty-six flats which are wired for electric lighting, cooking, heating, refrigerators, and domestic appliances. The supply is taken from the Kensington and Knightsbridge Co., the landlord's fixed charge being based on the kW of lighting actually installed and ¾d. per kWh for all electricity consumed, the tenants having the option of the same terms or the ordinary flat rates. The lighting has several distinctive features. The three main entrance doors have a glazed flush panel surround covering lamps in a plastered trough which illuminates the drives and also gives a pleasing decorative effect. The three



One of the main entrance doors and an entrance hall at Eresby House, Rutland Gate, S.W., showing built-in electric fires and the system of illumination adopted

entrance halls are illuminated by means of neon tubing concealed in cornices, giving reflected light on the ceilings. A Berry flush inset fire of 3 kW and also an electric clock are fixed in each of the halls. A power supply is provided for three 8-h.p. motors for the passenger lifts, three 3-h.p. motors for the goods lifts, and three 1-h.p. motors for service lifts. The passenger lift motors are supplied with d.c. at 400 V by means of a Hewittic rectifier. The goods and service lifts motors are fed direct from the a.c. three-phase supply. The boiler house is equipped with oil firing electrically controlled, with the usual motors, oil burners, sprays, &c. Each flat in addition to the usual lighting, which is very liberal and carried out to suit individual tenants' requirements, is wired for a cooker and refrigerator and a plug for an electric iron in the kitchen, and there are flush inset fires in the drawing rooms, dining rooms and bedrooms. The cooker and fires are, in most instances, hired from the supply authority. The electrical installation was carried out by the Berkeley Electrical Engineering Co., Ltd.

Loud Speakers in Mines

In order to lessen accidents in the mines a "safety first" demonstration was arranged at the Wyndham Colliery, Ogmore Vale, Glamorgan, on June 14th. Loud speakers and amplifiers supplied and controlled by Standard Telephones & Cables, Ltd., were erected at the pit-head and "safety first" slogans transmitted by means of gramophone records to the miners assembled for the 2 p.m. shift below ground. The demonstration was watched by the Ministry of Mines, H.M. Divisional Inspector for Mines, and many colliery owners and managers.

New Municipal Showrooms

The Fareham Urban District Council has decided to establish a showroom in connection with its electricity undertaking.

Acting on a recommendation of the Corporation Finance Committee, the Cardiff City Council has decided that the Electricity Department shall pay £25,000 to the Property and Markets Committee for the fish market, The Hayes, which is scheduled for conversion into showrooms and offices. The two Committees concerned had mutually agreed that the price should be £22,500. The cost of adapting the premises is estimated at £15,000.

Home Lighting

Electric Illumination Handbook No. 4B, issued by the E.L.M.A. Lighting Service Bureau, is a revised edition of the Home Lighting Handbook, with considerable additional matter and new illustrations showing good examples of the most up-to-date practice. The different parts of the house are dealt with in the order in which they would usually be seen by a visitor. The wattage of the lamps, types of fitting, and number of plug points recommended in each case is specified for various classes of property. There are also many notes incorporated that will be useful to those whose business it is to advise others regarding domestic lighting.

Employment During May

Employment in the engineering industry during May continued to show an improvement, but was still slack on the whole. According to statistics published in the *Ministry of Labour Gazette* the number of unemployed totalled 138,473, a decrease of 5,226 as compared with the preceding month, the percentage falling from 15 to 14.5 (in May, 1933, the figure was 23.7). In the electrical engineering section the number of unemployed was 8,152, the proportion falling slightly from 9.7 to 9 per cent. (16.7 per cent. in May, 1933). In the electric cable, apparatus and lamp manufacturing group the unemployed totalled 12,974, the percentage falling from 10.6 to 10.3 per cent. (16.5 per cent. in May, 1933). Unemployment in the electrical wiring and contracting industry, however, increased slightly from 4,362 to 4,573, and the percentage from 15.8 to 16.6 (18.8 per cent. in May, 1933).

Registered Electrical Contractors

Applications for registration by the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

T. Acton & Sons, Ltd., Hr. Openshaw, Manchester.
W. T. Sheldon, Blackburn.
E. Lee, Market Place, Pocklington.
H. A. Abba, Hull.
G. Shaw, Birmingham.
E. Marsh, Bridlington.
Lumb's (Patmos), Ltd., Todmorden.
R. Marshall Carr, Ltd., Macclesfield.
B. A. Fox, Morecambe.
Cooper-Bell Engineering Co., Ltd., Portslade.
K. Burrows, Hucknall.
Lishman & Sons, Darlington.

At the same meeting five applications were withdrawn and eight were declined.

Dutch-American Electrical Co-operation

During the first week of the current month, conferences are reported to have taken place in Holland between Dr. A. F. Philips and leaders of American concerns on various technical and commercial questions, which are stated to have led to

satisfactory results. The American representatives were Mr. D. Sarnoff, president of the Radio Corporation of America, Mr. H. Robertson, president of the Western Electric Co., and Mr. C. H. Minor, president of the International General Electric Co.

G.E.C. Radio Works Extension

The General Electric Co., Ltd., has recently considerably extended its Coventry works, where all its radio receivers are made. During the current year an additional 28,000 sq. ft. of floor area has been added to the works to cope with the bigger wireless manufacturing programme which has been embarked upon for the current season. The total floor area of the Coventry works is now approximately 733,160 sq. ft., the works standing in an estate of 150 acres. The aerial photograph reproduced herewith gives an excellent impression of the extensive character of the works, where over 3,000 people are regularly employed, a number which is increased very considerably during the peak of the season's production.

An aerial view of the G.E.C. works at Coventry which have recently been extended

Overseas Trade by Telephone

The means of communication that are at our command to-day have brought into existence quite a new set of conditions governing our conduct of overseas trading operations. How much used to be said about the difficulties of the traveller or representative in keeping promptly in touch with his principals at home, and about the loss of business that occurred through manufacturers and traders at home having to wait so long for contact to be established between themselves and a client far away! The accompanying photograph is a live illustration of practice that is possible and is actually adopted by some enterprising concerns to-day. It shows Mr. George Ellison, Junior, sales director of Messrs. George Ellison, Ltd., of Perry Barr, Birmingham, telephoning to the company's office in Johannesburg on Monday last in connection with an order placed with it for switchgear for South Africa.

Mr. G. Ellison, Jun., talking to South Africa

Better Times

As a result of improved trade, Messrs. R. A. Lister & Co., Ltd., of Dursley (Glos.), are giving a week's holiday on full pay to all their employés (nearly 2,000) who have completed a full year with the company. Mr. Percy Lister, the managing director, has just returned from a business tour of the world.

Irish Free State Electrical Imports

The imports of electrical machinery and cognate material into the Irish Free State during April last showed a slight advance, reaching a value of £67,504 as compared with £56,927 in the corresponding month a year ago. The appended table shows the imports during the first four months of 1933 and 1934; as will be seen there is a slight decline in the total due chiefly to the reduced imports of radio material.

	January–April. 1933.	1934.
	£	£
Electrical machinery	47,409	75,332
Electric wires and cables	22,863	30,682
Electric lighting accessories, fittings and parts ...	14,579	13,661
Radio sets and parts	76,781	42,917
Other electrical goods	65,130	61,328
Total	£226,762	£223,920

Trade Announcements

The Sparton Refrigeration Co. informs us that it is the main distributor for Great Britain of the "Sparton" refrigerator described on page 836 of our issue of June 8th. The price of the smallest model has been fixed at 38 guineas.

Messrs. McLeod & McLeod, Ltd., have been appointed sole distributors in the United Kingdom for the glass bulbs (used by electric lamp manufacturers) made by Kosta Glasbruk, of Kosta, Sweden.

Mr. W. J. Freshwater, proprietor of the Rugby Electrical Engineering Co., has opened new showrooms at 29c, Regent Street.

Messrs. John Godden & Co. have removed to Cranmer Court Works, High Street, Clapham, S.W. (Telephone: Macaulay 1081-2.)

The A.S.E.E. Moves

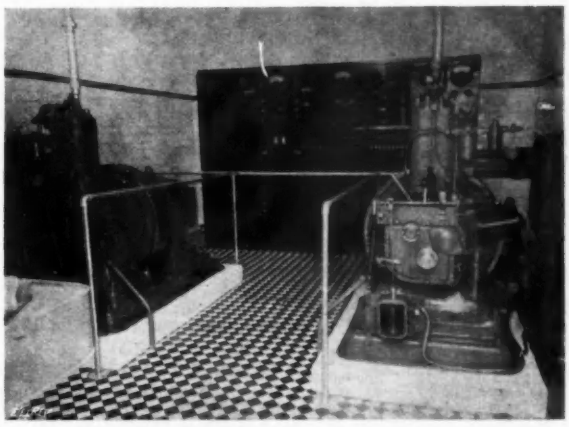
The Association of Supervising Electrical Engineers is changing its address on June 25th from Russell Square, to Aldwych House, Aldwych, W.C.2. Telephone: "Holborn 5610."

Recent Contracts

The "Beeantee" Illuminations, Ltd., has supplied large quantities of lampholders, gaskets, connectors and cable in connection with illuminations recently carried out by the Swanage Gas & Electricity Co., and Great Yarmouth Corporation, and for the Ramsgate historical pageant, exhibition and charter jubilee celebrations.

An Automatic House Lighting Plant

A house lighting installation has recently been completed at West Hill, Shanklin, I.O.W., the residence of Col. B. S. Millard, by means of which electricity is produced at a cost of 1d. per kWh, which is considerably cheaper than the public supply. The plant consists of two two-cycle Petter 7-h.p. cold-starting atomic Diesel engines, right and left hand, direct-coupled to Crompton Parkinson d.c. generators of 9.7 A (240 to 360 V), 650 r.p.m. The plant was installed entirely by Col. Millard's staff, under his personal supervision. The switchboard was made to Col. Millard's requirements by Austinlite, Ltd., Smethwick, Birmingham, and the combined starting and lighting battery (108 Ah capacity, consisting of 42-6 V standard units) was manufactured by the Young Accumulator Co. The plant is started and stopped automatically according to the state of charge of the battery. One set will start on a mains load of 6 A, the other cutting in automatically as soon as the load reaches 12 A, or any predetermined setting, surplus current being diverted to the battery. When the load is taken off the plant, the sets will stop, unless the batteries are not fully charged, when the sets will run until this is accomplished. An electrically wound time switch is incorporated to prevent the engine from cutting in during pre-determined hours of the night. Another time switch starts the engine once a week if necessary to give the battery a boosting charge.



A house lighting plant employing Petter engines and Crompton-Parkinson generators

An M.E.M. Sales Conference

The annual sales conference of the Midland Electric Manufacturing Co., Ltd., was held at the company's head office, Birmingham, on June 4th and 5th. Our picture shows representatives and the chief works executives during the afternoon of the second day when the annual bowling match was held. In the centre, seated, is Mr. W. L. Barber, managing director and founder of the firm, which is now in its twenty-sixth year.

Representatives at the annual sales conference of the M.E.M. Co.

For Sale

Salford Corporation has for sale a quantity of d.c. meters. (See our classified advertisements.)

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price, June 20th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£202	£4 dec.
Grade II ... ... ,,	£138	£3 dec.
Grade III ... ... ,,	£66	£1 dec.
c Brass (rolled metal 2" to 12" basis) ... per lb.	7d.	—
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9½d.	—
c ,, Wire, basis ... ... ,,	7½d.	—
c Copper Tubes (solid drawn)... ... ,,	10d.	—
g ,, Bars (best selected)... ... per ton	£62	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£35 15s.	—
g ,, ,, Sheets ... ,,	£35 5s. to £35 15s.	—
d ,, ,, Wire Rods ... ,,	£42 10s.	—
d ,, ,, H.C. Wire ... per lb.	7¼d.	—
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India rubber, Para fine ... ... ,,	5½d.	—
i Iron, Pig (Cleveland No. 3)... ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. qual. ... ,,	£20	—
g Lead, English Pig ... ... ,,	£12 15s.	5s. inc.
g Mercury ... ... per bot.	£11 5s. to £11 7s. 6d	7/6 to 10s. inc.
c Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	1/–	—
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8 $\frac{5}{16}$d.	—
r Steel, magnet, in bars ... ... ,,	7½d.	—
n Tin, Block (English) ... ... per ton	£225 10s. to £227 10s.	£2 10s. dec.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f Indian-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. R. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the rise in the cost of living justifies an increase in wages in the industry as from the third pay-day in July for the period covered by that pay-day. The increases will restore the figures to those in force up to the second pay-day of the current month.

An Electric Lamp Development

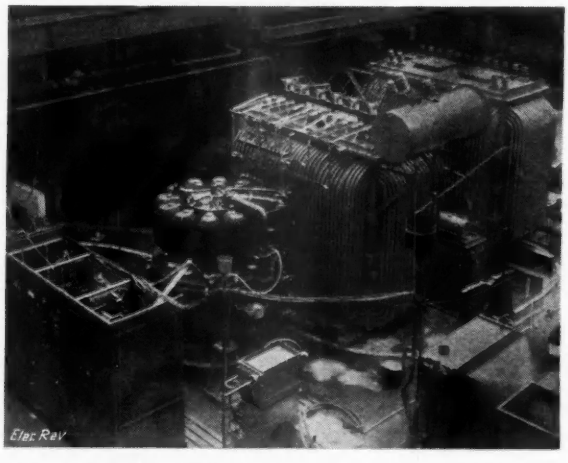
The Aurora Lamp Company, Old Kilpatrick, Dumbartonshire, informs us that it is placing on the market 60-W and 100-W gasfilled coiled-coil lamps in which, the company informs us, the tungsten wire is spiralled in the usual way on a mandrel, and then respiralled on a second mandrel. As the surface presented to the gas filling is very much less than that of a single spiral for the same voltage and wattage, less energy is wasted in conduction and convection, thus enabling a thicker wire to be used for the same wattage. These factors are claimed to result in the production of 20 per cent. more light than comparable ordinary gasfilled lamps.

Social Event

At the West End Amateur Athletic Association championship meeting held on June 13th, the winners included Mr. G. O. Sycamore, of the G.E.C., who retained the 440 yds. championship. The ladies' relay and the men's one-mile medley relay were also won by teams representing the G.E.C.

Works Visit

Lord Provost the Rt. Hon. W. J. Thomson, and members of the Edinburgh Town Council recently visited the works of Messrs. Bruce Peebles & Co., Ltd. The party was received by Dr. Watt, chairman of the company, and was conducted on a tour of inspection by Mr. G. L. Kirkpatrick, managing director, Mr. J. W. Rodger, works manager and chief engineer, Mr. G. H. Henderson, assistant works manager, and Mr. R. P. Hilton, sales manager. The welding shop, rotating electrical machinery and rectifier shops and the transformer shop were among the departments visited, special interest being taken in a 2,500-kW rectifier equipment which was seen under test. This equipment is one of twenty-three being supplied to the Southern Railway Co. in connection with the Eastbourne-Lewes-Hastings and the Sevenoaks electrification schemes. Each equipment consists of a rectifier, main transformer, switchgear for controlling the equipment, complete with all accessories and auxiliary plant. The visitors also inspected component parts of the rectifier equipment in course of construction. Other machines seen on test were a 1,000-h.p. generator for a bacon factory and two 600-h.p. motor generator sets for Brazil, also several rectifier equipments for various Corporations, as well as various industrial type electric motors, in all equivalent to about 7,000 h.p. The various shops were inspected in which contracts are in hand for this country and abroad, aggregating approximately 130,000 h.p. In the transformer shop a large number of equipments of various sizes, both of the power type and distribution units, were seen under construction, as well as on test. The visitors were shown one of the testing transformers with which the shop is equipped working at a pressure of 500,000 V. On the completion of the tour of inspection the visitors were entertained to tea in the boardroom.



A Bruce Peebles 2,500-kW mercury-arc rectifier equipment for the Southern Railway on test

New Catalogues and Lists

Falk, Stadelmann & Co., Ltd., 83/93, Farringdon Road, E.C.1.—Catalogue of "Antarctic" fans and "Cubelite" lighting fittings.

Clarkes (Redditch), Ltd., Sinew Works, Redditch.—Leaflets on "Paragon" high-tension ignition terminals for motor vehicles.

Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.—A leaflet on a range of pressure-operated switches.

Leda Electric, Ltd., Oldham Road, Miles Platting, Manchester, 10.—A leaflet on the new table service cabinet.

Holden & Brooke, Ltd., Sirius Works, Manchester, 12.—Particulars of the "Dome" and "Radome" steam traps.

Medical Supply Association, Ltd., 167/173, Gray's Inn Road, W.C.1.—A new brochure on foam therapy.

Ferranti, Ltd., Hollinwood.—A broadsheet on six superheterodyne radio receivers.

Alliance Wholesale, Ltd., 62, Gt. Russell Street, W.C.1.—"Alliance Topicalities" No. 16 dealing with refrigeration.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—Particulars of "Ankaflex" cable.

Marelli & Co., Ltd., 19/20, Garlick Hill, Queen Victoria Street, C.4.—The new season's fan catalogue.

Harken Electrical Co., Ltd., 18a, South End, Croydon.—A leaflet on short-wave convertors.

Sloan Electrical Co., Ltd., 8/12, Golden Lane, E.C.1.—A leaflet entitled "Do it Electrically," describing domestic appliances.

British Insulated Cables, Ltd., Prescot, Lancs.—Booklets on dynamo and instrument wires, l.p. terminal boxes, bell wires, and a unit for feeder and distribution pillars. Also a complete list of B.I. publications

Bankruptcy Proceedings

J. H. Peacock, Cornmarket, previously 35, Ropergate, both Pontefract, wireless retailer.—The public examination herein was held at the Court House, Wood Street, Wakefield, on June 14th. The statement of affairs submitted showed gross liabilities of £400, and there was a deficiency of £222. The failure was attributed to lack of capital, effects of a fire at adjoining premises, and enforced removal. The examination was closed.

C. T. Waterhouse, 137, Smawthorne Lane, Castleford, electrical engineer.—The public examination herein was held at the Court House, Wood Street, Wakefield, recently. Debtor said his failure was due to lack of capital and bad trade as a result of the general depression. His statement of affairs showed liabilities of £155 and a deficiency of £120. The examination was closed.

G. H. Dye (lately trading as "Rix and Dye," 47, Botolph Street, Norwich), now trading as the Radio Electrical Service, 3, St. Augustine's Street, Norwich, electrical engineer.—At the public examination held on June 12th at Norwich, it was stated that the gross liabilities were £316, and the net assets £65, the deficiency amounting to £231. The failure was attributed to bad trade and ill-health. The examination was concluded.

A. Wolstenholme, electrical engineer, 26, Bridge Street, Swinton.—Receiving order made June 8th on debtor's own petition.

D. J. Watkins (Watkins & Son), wireless and electrical engineer, 72, Victoria Road, Surbiton.—First meeting June 25th at 29, Russell Square, W.C. Public examination August 7th at the Town Hall, Kingston-on-Thames.

C. E. Wooton, electrical engineer, 10, Cemmaes Terrace, Collett Road, and 109, Marlowes, Hemel Hempstead.—Discharge suspended for six months until November 15th, 1934.

M. Goldsmith (Regent Radio Co.), wireless dealer, 24, Russell Street, Plymouth.—Last day for receiving proofs for dividend June 30th. Trustee, Mr. A. N. F. Goodman, 11, St. Aubyn Street, Devonport, Official Receiver.

W. S. Handley and **G. Taylor** (Handley & Morgan), wireless dealers, 55, Lower Union Street, Bristol.—First and final dividend of 1½d. in the £, payable June 15th at 26, Baldwin Street, Bristol.

S. J. Cocks (Artlite), electrical engineer, 120, Holland Park Avenue, W.—Receiving order made June 13th on debtor's own petition. First meeting July 2nd, and public examination September 18th, both at Bankruptcy Buildings, Carey Street, W.C.

M. J. Wallage (Wallage & Sons), electrical dealer, 68, Rugby Road, Brighton.—Receiving order made June 12th on a creditor's petition.

H. A. Sanders, electrical engineer, Black Cat Restaurant, Chawston, Beds.—Application for discharge to be heard on July 25th at the Shire Hall, Bedford.

L. A. Woodhead, wireless dealer, 25a, Charles Street, Bradford.—Application for discharge to be heard on July 10th at the County Court, Bradford.

R. T. Styles (Styles Radio), 132, Somers Road, Southsea.—Trustee, Mr. C. J. Pyke, 87, High Street, Portsmouth, Official Receiver, released June 1st.

W. M. Horsfall, electrical engineer, 7, Redcross Street, Liverpool.—Last day for receiving proofs for dividend June 30th. Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver.

H. G. Lawson (E. Cooper), radio and electrical dealer, 1002, Stratford Road, Hall Green, Birmingham.—Last day for receiving proofs for dividend July 2nd. Trustee, Mr. C. Hoult, 159, Great Charles Street, Birmingham, Official Receiver.

A. J. Gridley (A. J. Gridley & Co.), electrical engineer, 170, Stockwell Road, S.W.—First and final dividend of 1¾d. in the £, payable any day at Bankruptcy Buildings, Carey Street, W.C.

J. H. K. Reynolds, wireless dealer, 208, High Street, Poole, and at Bournemouth.—First and final dividend of 1s. 8d. in the £, payable June 29th at 10, Rockstone Place, Southampton.

Company Liquidations

Electrical & Radio Products (1931), Ltd.—The first meetings of the creditors and shareholders under this compulsory liquidation were held on June 12th at London Bankruptcy Buildings. Mr. J. Barwick Thompson, Official Receiver, reported that the company was formed in August, 1931, to acquire the undertaking of Electrical & Radio Products, Ltd., which had in the previous January taken over the assets and property of the Aeonic Radio, Ltd., which was incorporated in November, 1928, to manufacture and sell wireless apparatus, &c. The statement of affairs showed total liabilities of £58,971, of which £10,838 was owing to unsecured creditors and £23,763 for debentures; the assets were valued at £13,146, and would be absorbed by the debenture claims. The company's failure was attributed to lack of working capital, difficulty in obtaining credit, inability to obtain admission to the Wholesale Manufacturers' Association, long illness of the managing director, and reduction of prices by the large manufacturers in February, 1934. The liquidation was left in the hands of the Official Receiver.

Importers & Distributors, Ltd., dealers in electric lamps, &c., 173-5, Great Portland Street, W.—The statutory first meetings of the creditors and shareholders under the compulsory liquidation of this company were held on June 15th at Carey Street. Mr. G. W. Hutcheson, Assistant Official Receiver, reported that the company was promoted in March, 1933, by Mr. Julius Stief to deal in electric lamps imported from Holland and Austria. The increased tariff on imported goods stopped the company from obtaining electric lamps from abroad in 1930 and thereafter, under the style of "The All-British Electric Lamp Co.," the directors dealt only in goods manufactured in this country. Debentures for £1,400 were issued in September, 1932, and February, 1933, to secure cash advances and in January last Mr. A. Chester Watts-Jones was appointed receiver, which step was followed by the winding-up petition lodged by the Insular Electric Glowlamp Works, Ltd. The company's assets are valued at £1,180, and will be absorbed by the debenture claim, leaving nothing for the unsecured creditors for £1,281. The failure of the company is attributed to lack of capital, bad trade, keen competition and cancellation of contracts owing to the supply of faulty goods. The liquidation was left in the hands of the Official Receiver.

Automatic Rectifying Plants, Ltd.—Meetings July 18th at 150, Southampton Row, W.C., to receive an account of the winding-up by the liquidator, Mr. C. C. L. Halstead.

The Hertfordshire Show

THE electrical display of the North Metropolitan Electric Power Supply Co. at this year's Great Hertfordshire Agricultural Show in Hatfield Park last week occupied two sites. A row of stands 75 ft. long by 14 ft. wide featuring domestic appliances was separated by a broad gangway from the larger island site 75 ft. long by 45 ft. wide facing the Grand Parade Ring and devoted to agricultural exhibits.

These included an English Electric 5-h.p. two-wheel truck motor, G.E.C. 2-h.p. skid motor and 5-h.p. "Drumotor"; Bamford cake breaker, corn crusher and 10 in. saw bench with motor, Drake & Gorham water pump and pressure tank, Wolseley sheep shearer, Ferranti pig stunner, and a "robot" fireman stoker by the International Combustion Co.

Grouped at one end was such dairy equipment as a Kelvinator milk cooler and cold room; Lister churn, butter-cutting machine, and cream separator; Barford & Perkins 4-kW steriliser and bottle washer, "Alka" bottle capping machine, and a "Vaccar" milking machine.

At the other end were a nursery accelerator pump and fan unit by Pullen & Co., a Church greenhouse with various types of frame and soil heating devices, a 300-gallon automatic rotary pump by the S.A.M. Pump Co., and Ransomes and "Roto-scythe" motor-driven lawn mowers.

The poultry section included four Curfew incubators of from 100 to 3,000-egg capacity, a five-tier battery brooder with day-old chicks, two hovers, 100-egg hot water and hot air incubator heaters, drinking vessel and water trough heaters; Topham & Sunshall "Visi-Chik" brooder, G.E.C. hover and drinking water warming plate, late hour poultry lighting gear and egg testing lamps; Bricknell, Munro & Rogers egg grader, Cope & Cope egg cleaner and a Bingham poultry plucking machine.

At one end of the sectionalised domestic exhibits was a kitchen containing a Jackson 46J cooker, 1.5-gallon "Aidas" water heater, 4.2 cu. ft. Kelvinator refrigerator, Hawkins "Mixheat" machine, a white Smith's electric clock, G.E.C. oscillating fan, and Siemens "Sanaray" lighting unit.

In the water heating section were three Ferranti heaters, a "Densacone" under-the-basin type, a tank with Hotpoint immersion element, "Satchwell" thermostat, and cork wool lagging; an "Easy" washing machine, three "Burco" wash boilers, Nobbs floor and wall type hot water radiators, G.E.C. shaving mug, and a Bulpitt kettle and immersion heater.

The refrigerator section contained four "Kelvinator" machines of different sizes and an ice cream freezer, while the general section included two Hotpoint, two G.E.C., and two Jackson cookers, Hoover and Hotpoint vacuum cleaners, G.E.C. floor polishers, Bulpitt green enamel coffee percolator with cups and saucers to match, Smith's clocks and fires of the Belling, Berry, "Ediswan," Ferranti, and G.E.C. patterns. Also G.E.C. and Siemens fans, G.E.C., Revo, Siemens and Henley's irons, Hawkins's "Supreme" culinaire, G.E.C. toaster and hair dryer, Bulpitt kettles and saucepans, the British Central Electrical Co.'s "Gripper" hand inspection lamp, and a selection of table and floor standard lamps.

The stands were well staffed for demonstration purposes and advertised by means of several stationary and flashing signs, one of which was fixed to wires supported on wood poles representing an overhead distribution line. The Northmet Co. has for the last four years been awarded a silver medal for the best stand in the show.

Electricity Supply

Lighting, Domestic, Power

Beckenham (Kent).—ALTERNATIVE SUPPLY.—Provisions for ensuring an alternative supply in the event of a breakdown are to be made by the Council at a cost of £8,942.

Bingley (Yorks.).—REDUCED CHARGES.—Following the recent change in the electricity supply at Bingley, by which the town's bulk supply is obtained from the Yorkshire Electric Power Co. instead of the Keighley Corporation, a reduction in the charges to consumers is in prospect. The Finance Committee has accepted a new scale of charges submitted by Mr. O. G. Cook, the electrical engineer and manager, which will result in reductions in practically the whole of the existing tariffs. The present all-in system will be replaced by one based on rateable value, plus a low "unit" charge, while the charges for ordinary lighting, slot meters, heating, and domestic and ordinary power will be reduced by approximately ½d. per kWh. It is proposed to introduce the new charges on July 1st next.

Bradford.— EXTENSION. — The Electricity Committee has approved of the erection of a district transformer station at Aldermanbury, for the purpose of supplying electricity to the new premises of the Bradford Co-operative Society, Ltd., and the district network, at an estimated cost (excluding site but including distributing cables) of £9,502.

Bridport.—PROGRESS.—The annual report of the electricity undertaking has just been issued, and shows a surplus of £1,909 for the year ended March 31st last. The undertaking started up just over four years ago. The area covered by the Order totals over 44,000 acres with a population of just over 15,000; this low density of population, together with the hilly nature of the country, means relatively expensive distribution. However, mains have been extended from nine miles to twenty-seven miles, covering a population of about 10,000, and an additional twelve miles of mains are in hand which

The Bognor Gas & Electricity Supply Co.'s new sub-station which has been designed to fit in with the surroundings

will enable another 2,000 persons to be served. The undertaking has a showroom and carries out most of the house wiring. Cookers, kettles, water heaters and wash boilers are hired on reasonable terms; 241 cookers are in service, one to each 4.8 consumers, and 335 kettles, one to each 3.5 consumers. The price of gas is 5s. per 1,000, and in view of the surplus on the year's working, the borough electrical engineer, Mr. H. F. Castle, has recommended considerable reductions in all scales of charges.

Brighton.—MAINS EXTENSIONS.—Mains are to be extended by 900 yards at a cost of £732.

SUB-STATION.—In order to meet an increasing demand in the Rottingdean Heights area, the erection of a kiosk sub-station at a cost of £1,128 has been approved, and a 250 kVA transformer will be installed. Other districts to be provided with sub-stations are South Moulsecomb (500kVA), at a cost of £673; and Roedean (250 kVA), £1,240.

Burnley.—RURAL AREAS.—The Rural District Council has consented to the Corporation's application for a Special Order enabling it to supply electricity to Habergham Eaves and Ightenhill, provided the charges to consumers do not exceed those in force within the borough.

Campbeltown.—PROVISIONAL ORDER.—The Town Council is to oppose the Provisional Order promoted by an English company for permission to supply electricity for part of Mid-Argyll and the whole of Kintyre. The County Council of Argyll supports the project.

Carlisle.—LOAN.—The Electricity Committee has obtained sanction to borrow £5,000 for the assisted-wiring scheme, £5,000 for meters, and £5,000 for transformers and sub-stations.

MAINS EXTENSIONS.—The Committee is to extend mains at an estimated cost of £1,676.

Colchester.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains in Ipswich Road at a cost of £858.

Dartford.—LOANS.—The Town Council has applied for loans of £3,000 for l.p. mains and distributors, £3,500 for services, and £1,500 for meters. The West Kent Main Drainage Board has given six months' notice to determine the agreement for a supply of electricity consequent on the Board installing its own generating plant.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains and provide a kiosk at Pilgrims Way at a cost of £910, and apply for sanction to borrow £8,000 for mains, services and meters.

Dorchester.—LOAN.—The Town Council has applied for a loan of £2,000 for cables, etc.

Douglas (I.O.M.).—EXTENSIONS.—The Electricity Committee is to carry out extensions to the plant at the electricity works in accordance with the scheme of the borough engineer, which has been confirmed by Messrs. Kennedy & Donkin, consultants. The estimated cost of the extensions is £40,000.

ALTERNATIVE OPTIONAL TARIFF.—The borough electrical engineer has reported to the Electricity Committee on the tariff for outside signs, including flood-lighting. It has been decided, as from July 1st, to offer consumers the option of taking a supply for these purposes on a tariff of £8 per kVA p.a., plus ¾d. per kWh.

Ealing.—LOAN.—The Town Council is to apply to the Electricity Commissioners for sanction to borrow £10,000 in respect of high voltage mains; and £20,000 in respect of mains and services in connection with the change-over to three-phase supply.

East Ham.—LOAN.—The Electricity Committee has obtained sanction to borrow £20,000 for electricity meters.

NEW SUB-STATION.—The expenditure of £1,439 is recommended for the provision of equipment at the proposed new sub-station at Kensington Avenue, and for the laying of the necessary cables in High Street North.

MAINS EXTENSIONS.—The Committee is to extend mains at a cost of £1,205.

Fareham.—NEW TARIFF.—The Urban District Council has decided to adopt a two-part tariff. The following charges are to be introduced:—Electric cookers, 6s. and 5s. per quarter; water heaters, 6s. 6d. and 3s. 6d.; wash boilers, 5s.; fitting and wiring up to 50 ft. for cookers and 50 ft. and 10 ft. of lead pipe for boilers and water heaters are to be free of cost.

Fleetwood.—REDUCED CHARGES.—The electricity undertaking made a profit of £6,900 during the past year, and, as a result, the electricity charges are to be reduced for all consumers.

Glasgow.—REDUCED CHARGES.—The Strathclyde Electricity Supply Co., Ltd., has decided to reduce the charges for electricity in the burgh of Rutherglen consequent on the reduction of Glasgow Corporation's electricity rates.

Godstone.—OVERHEAD LINES.—The Rural District Council has raised no objection to the Horley & District Electricity Supply Co., Ltd., using overhead lines at Burstow and Nutfield. With regard to a similar application by the Sevenoaks & District Electricity Co., Ltd., the Council has informed the company that underground mains should be used along the main road from Newchapel to Woodcock Hill, and that there is no objection to overhead lines along the road leading to Wire Mill.

Goosnargh (Lancs.).—SUPPLY INAUGURATED.—Electricity has been introduced to Goosnargh by the Preston Corporation.

Grantham.—PURCHASE OF UNDERTAKING.—The Town Council proposes to purchase the Urban Electric Supply Co.'s undertaking.

Halsall.—EXTENSIONS.—The West Lancashire Rural District Council has approved of mains extensions to New Cut (£1,300) and Moss Lane (£1,400).

Ilford.—LOAN.—The Electricity Committee has obtained sanction to borrow £25,000 for meters.

Japan.—NEW POWER STATIONS.—Our Yokohama Correspondent reports that the Showa Power Co., Ltd., is commencing work on a 60,000-kW hydro-electric scheme, and the Yahagi Hydro-Electric Power Co. is to construct a 12,500-kW at Yoshinodani on the Ozoye River and a 14,000-kW steam generating station at Nagoya.

SUPPLY PROGRESS.—During 1933 the amount of electricity generated on the mainland was 11,986,687,000 kWh (hydro-electric) and 2,056,277,000 kWh (by steam); 330,354,000 and 27,285,000 kWh respectively in Shikoku; 1,807,861,000 and 604,378,000 kWh respectively in Kyoshu, and 575,496,000 kWh and 15,188,000 kWh in Hokkaido.

Leigh.—YEAR'S PROGRESS.—In his annual report for the year ended March 31st last, the borough electrical engineer, Mr. J. B. Hudson, states that there is a net profit of £8,965, as compared with £6,690 for the previous financial year. The output for industrial power purposes represented 76.9 per cent. of the total sales, which amounted to 13,733,657 kWh, an increase of 11 per cent. During the year 856 new consumers were connected.

Liverpool.—REDUCED CHARGES.—The Electricity Department has decided to reduce the charges at Hightown to the same amount as that charged in the city.

London.—THE COUNTY COMPANY EXPANDS.—The County of London Electric Supply group of companies has recently acquired several smaller electricity undertakings which are on the borders of, or within, the area of the County Group. These include two in Essex, namely, Chelmsford and Saffron Walden;

Caterham and Woldingham in Surrey; Swanage in Dorsetshire, and New Milton and Barton-on-Sea in Hampshire. The Saffron Walden undertaking was acquired from the Municipality.

FULHAM.—The Electricity Committee proposes seeking sanctions for borrowing £5,000 for purchase of domestic apparatus; £765 for a sub-station site at Munster Road; £456 for the equipment of a sub-station on Messrs. Loud & Western's premises; £2,706 for the erection of and equipment for an electricity sub-station at the rear of 72, Petley Road; £5,000 for the provision of additional switchgear and cable works at the Hurlingham sub-station; and £6,500 for the installation of a l.p. distribution system in the following areas—Hurlingham, Crabtree Estate, Fulham Road, Bishop's Park, and West Kensington. The Electricity Committee recommends the expenditure of £3,500 for the purchase of 1,000 20-A multi-coin slot meters.

SYDENHAM.—The South Metropolitan Electric Light & Power Co., Ltd., is to extend h.p. cables along West Hill, and Lawrie Park Road.

SHOREDITCH.—The London County Council is arranging for electric lighting installations (including 5-A plug points) in the new blocks of dwellings which it is erecting on the Provost Street and Haggerston Road sites, no provision being made for heating and cooking by electricity. The Council suggests that rising mains shall be provided by the Shoreditch Borough Council free of cost to the L.C.C., and that the mains should be of sufficient capacity to enable electric heating and cooking to be provided at a later date for any tenants who desire to change over from gas to electricity for such purposes. The Electricity Committee has agreed to bear the cost of the rising mains subject to permission being given to install during the erection of the buildings, the necessary switchgear, conduit outlets, etc., for domestic use in each tenement. The L.C.C., however, refuses to grant the facilities asked for, and the Committee is therefore of the opinion that, in the circumstances, it should not incur the expense of providing rising mains free of cost. It is suggested that a protest should be made to the L.C.C. against the withholding of facilities to install equipment for heating and cooking in accordance with its offer, thus giving an advantage to gas.

STOKE NEWINGTON.—The Electricity Committee recommends the borrowing of £5,000 for electricity meters and £3,844 for cables.

Llandudno.—REDUCED CHARGES.—The Electricity Committee has recommended the Urban District Council to reduce the charge for electricity for lighting from 4d. per kWh to 3¾d.

Luton.—LOAN.—The Town Council has applied for a loan of £1,496 for extending the overhead line to Dagnall. Consent has been received to the use of overhead lines at Flamstead, Pitstone Green, and Flitwick.

Maidstone.—EXTENSION.—The Rural District Council has approved of an overhead line for the extension of the supply along the Headcorn Road to Staplehurst by the Weald Electricity Supply Co., Ltd.

New Mills.—LOANS.—The Council has decided to apply for powers to borrow £7,244 for an electricity scheme and £1,607 for extensions. The estimated loans for the next three years are £3,000 for mains, £2,000 for assisted wiring, and £2,000 for services and meters.

Northamptonshire. — REDUCED TARIFFS. — Revised tariffs operative from the midsummer meter readings are announced by the Northampton Electric Light & Power Co., Ltd., the Wellingborough Electric Supply Co., Ltd., and the Rushden & District Electric Supply Co., Ltd. The general lighting rate is now: Northampton zone, 5d. per kWh, to 7d. in fringe area; Wellingborough, Rushden, Higham Ferrers, 6d. per kWh, to 8d. in fringe area. Power: First 500 kWh per qr., Northampton 1.75d., other districts 2.25d.; next 25,000 kWh per qr., Northampton 1d., other districts 1.1d.; remainder, Northampton 0.9d., other districts 1d. Substantial reductions have also been made in hire charges for motors. Parts of Buckinghamshire are affected by reductions in the Northampton Co.'s charges.

Paisley.—LOAN.—The Electricity Commissioners have authorised the Corporation to borrow £5,867 for mains and services, £5,000 for meters, and £803 for plant (sub-station equipment), &c.

Portsmouth.—LOAN.—Application is to be made by the Electricity Committee for sanction to a loan of £50,000 for sub-station equipment and switchgear.

Salford.—NEW EQUIPMENT.—The Town Council proposes to install "Economic" boilers, a centrifugal fan (£2,450) and storage boiler, superheater, &c. (£350), at the Royal Technical College.

Spalding.—LOAN.—The Urban District Council has received sanction to a loan of £2,950 for mains extensions to Moulton and Pinchback West.

Swansea.—NEW WORKS.—The Electricity Committee is to carry out the following works for the equalisation of pressure in various parts of the borough: Laying e.h.p. main from Neath Road to a sub-station to be erected in Grandison Street, Hafod, at a cost of £1,420; an e.h.p. main from Brynhyfryd to a sub-station to be erected at Roger Street at a cost of £3,563; an e.h.p. main from Mansel Street to a sub-station to be erected in Page Street, at a cost of £3,165.

STREET LIGHTING.—The Highways Committee has decided to lay the mains for street lighting at an estimated cost of £3,050.

ELECTRIC COOKERS.—The Electricity Committee is to install electric cookers in council houses, under the Corporation hire scheme.

Tynemouth.—SUB-STATION.—The Electricity Committee has decided to proceed with the erection of the sub-station at Lovaine Place, and has instructed the borough engineer to prepare plans and to invite tenders for the work.

Warwick.—OVERHEAD LINES.—Plans for an overhead transmission line to Finwood Hill, Rowington, for the Warwickshire Electric Power Co., have been approved by the Warwick Rural District Council.

Wellingborough.—OVERHEAD LINE INQUIRY.—The Urban District Council has received satisfaction from the Ministry of Transport inquiry on April 12th. In the decision just received, the Minister of Transport has ordered the elimination of all overhead electricity cables at the Brook Farm Estate, except for a short length adjacent to the flanked frontage of one of the council houses, which will afford a supply to two houses at the rear of the Finedon Road houses.

An application by the Wellingborough Electric Supply Co., Ltd., for consent to the erection of l.p. overhead lines along Harrowden Road has been rejected by the council.

SUPPLY FOR PUMPING.—Suitable terms have been reached between the Council and the Wellingborough Electric Supply Co., Ltd., for electricity supply to the new Orlingbury pumping station.

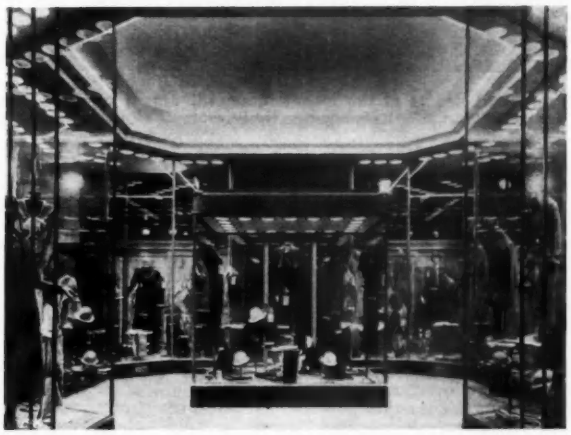
West Hartlepool.—LOANS.—The Town Council has received sanction from the Electricity Commissioners to the borrowing of £10,000 for mains and services and £2,460 for the provision of converting plant at the Burn Road sub-station.

Weston-super-Mare.—REDUCED CHARGED.—The Weston-super-Mare & District Electric Supply Co., Ltd., has reduced the price of electricity for lighting to 6d. per kWh for the first 100 kWh per quarter, and 4½d. per kWh beyond, with a discount of 5 per cent. for prompt payment of accounts.

Wigan.—REDUCED CHARGES.—The electricity undertaking's surplus on the past year's working amounted to £13,000, of which £12,000 has been allocated for the reduction of electricity charges and £1,000 towards the provision of a free cable service up to 15 feet on private land. For lighting the new charge is 3¾d. (4d. previously) and the domestic tariff 15 per cent. of the rateable value plus ½d. per kWh (as compared with 20 per cent. plus ½d. per kWh). The amount sold during the year totalled 20,629,658 kWh, an increase of 3,636,189 kWh, and the number of consumers increased from 8,926 to 10,591.

Wolverhampton.—REDUCTIONS.—The Electricity Committee recommends the reduction of various charges, representing a concession of £4,000 per annum.

YEAR'S PROGRESS.—The Electricity Committee reports a year of progress. The sale of electricity has increased over that of



Window display lighting by "Cecoray" reflectors at Messrs. Hutton's, Oxford Street, W. The lighting of the dome over the entrance is by G.E.C. "sunlight" tubing

the previous year from 95,224,824 to 110,608,766 kWh, and the revenue from the sale of electricity has increased by £23,820. The average price received from all classes of consumers was 0.78d. per kWh. The maximum load was 30,800 kW, an increase of 2,400 kW, and the load factor of the system was 43.59 per cent. There were 3,586 consumers connected during the year, bringing the total number connected to 31,320. At March 31st, 1934, there were 10,252 consumers under the assisted wiring scheme. The balance of the revenue account for the year amounted to £118,349. After making allowance for the proposed rebate of 5 per cent. to certain consumers for the year ended March 31st, 1934, there is a balance available for appropriation of £29,558. The Committee recommends tariff amendments which will cost £4,000.

Workington.—LOANS.—The Electricity Committee has obtained sanction to borrow £820 for the purchase of land for the erection of a sub-station, £1,612 for mains, and £1,806 for sub-station equipment.

Traction

Denmark.—RAILWAY ELECTRIFICATION.—According to the *Railway Gazette*, as soon as the electrification at present in hand has been completed, the line from Valby to Vanlose is to be equipped for electric traction. This work will form the final link in a complete " inner circle " of electrified lines and also the first section of the electrification to Ballerup.

Finchley.—OVERHEAD EQUIPMENT.—The Middlesex County Council has approved an expenditure of £1,650 for the provision of overhead equipment in connection with the tramway works forming part of the Tally Ho corner improvements.

Germany.—UNUSUAL TROLLEY BUS CHASSIS.—The M.A.N. Co. of Augsburg, in conjunction with Siemens-Schuckertwerke A.-G., Berlin, has recently produced a new six-wheel trolley bus chassis, which is intended to be fitted with bodywork adapted to accommodate seventy passengers. Two 55-kW electric motors are mounted outside the frame (one on each side), well within the wheel-track width. The shafts of the motors are arranged longitudinally with and outside the frame, and are provided with extensions which drive the rear road wheels through worm gearing. In this way one motor drives the two rear road wheels on the near side of the chassis, and the second motor the two wheels on the offside.

ANOTHER DIESEL-ELECTRIC TRAIN TRIAL.—The Diesel-electric train which is to maintain a regular express service between Cologne and Berlin covered the journey of 380 miles in 4h. 19m., including two stops, on trial run recently. A maximum speed of over 110 m.p.h. was attained.

Italy.—RAILWAY ELECTRIFICATION.—In pursuance of the 4,200,000,000 lire programme of railway electrification announced by the Italian Minister of Communications last year, conversion work is now proceeding on the coast line southwards

Prominent people at the recent inaugural dinner of " Quaintways," an all-electric café, in Chester (See page 899)

Left to right (sitting): Mr. C. D. Taite, the Mayor of Chester, Mr. D. Beck, Sir William Ray, and Ald. R. Matthewson. (Standing): Councillor C. Jones, Mr. Thompson, Mr. J. Beck, Councillor D. Jones, the Sheriff of Chester, Mr. S. E. Britton, Mr. J. H. Dickson, Mr. A. Simpson, and Mr. W. David.

from Naples to Reggio Calabria. It is anticipated that electric operation will commence over the 40 miles from Naples to Salerno at the end of this year, and that the whole 300 route miles from Naples to Reggio will be electrified on the 3,000 V d.c. system by the end of 1937.

The report of the Italian State Railway authorities shows that up to June 30th, 1933, 1,260 miles of the system (2,500 miles of track) had been electrified. The main power supplying cables had a length of about 710 miles, of which all but 118 miles were overhead, there being also 2,513 miles of cables supplying the traction power. Altogether there were seventy-two static transformer sub-stations in use, with an installed capacity of 362,050 kVA and twenty mercury-rectifier stations with a total capacity of 57,160 kW. In addition nineteen travelling sub-stations (40,430-kVA) were in use. There were also about 12 miles of electric railways owned by Italy, but operated by the Swiss Federal Railway authorities. The supply of three-phase power at 16⅔ cycles is drawn from twelve hydro-electric and three thermal generating stations having a total capacity of 198,830 kW of which 115,560 kW is used for the State Railway supply. In addition six other stations supply three-phase power at other than 16⅔ cycles. The number of electric locomotives and motor coaches was increased during the year from 929 to 951, of which 791 have two electric motors, 44 four motors, and 116 six motors. Altogether a total of 2,454 electric motors are in use on the locomotives and coaches with a total rating of 1,648,710 kW.

Newcastle.—TROLLEY-BUSES.—Powers are being sought by the Corporation for the provision of trolley-bus services and the abandonment of certain tramways.

Southampton.—DECREASE IN TRAMWAY RECEIPTS.—For the year ended March 31st last over one and a half million fewer passengers were carried by the Corporation tramcars, resulting in a decrease of nearly £9,000 in receipts. Bus receipts, however, showed an increase of £3,500 and over half a million more passengers were carried. The transport undertaking as a whole has a surplus of £8,882.

Traffic Signals.—The Yarmouth Corporation is to consider the question of installing automatic traffic signals at the junction of Beccles Church and Burgh Road. Additional signals are to be installed at Reading; and the Acton Highways Committee is to prepare a scheme for the provision of traffic lights at the junction of Creffield Road and Twyford Avenue.

The Rotherham Corporation is to install traffic signals at the junction of Frederick Street and Effingham Street at an estimated cost of £710.

Communications

Ceylon.—GOVERNMENT TO RETAIN COMMUNICATION SYSTEMS.—It is revealed in the annual report of the Postmaster-General of Ceylon that the Executive Committee discussed the advantages and disadvantages of selling the telephone and telegraph systems to Imperial and International Communications, Ltd. It was decided not to sell.

China.—RADIO AND TELEPHONE DEVELOPMENTS.—According to the *Chinese Economic Bulletin* Dr. Wen Yu-ching, director of the Bureau of International Telegraphs, has announced that direct radio communication between China and Italy will be established in August.

In order to unify the radio administration, the Ministry of Communications is taking steps to suspend the independent operation of radio stations by various party and Government organs. With the exception of military stations radio services will be under the direct control of the Ministry.

TELEPHONE PROGRESS.—In order to foster closer contact among the provinces of Kiangsu, Chekiang, Anhuei, Kiangsi, Hunan, Hupeh, Honan, Chihli and Shantung, the Nanking Ministry of Communications is planning the installation of a network of long-distance telephones and has approached the Board of Trustees for the British Boxer Indemnity Refund for a loan to carry out the project. Nanking will be the centre of the system, and altogether there will be four main and four branch lines. The trunk routes will be the Nanking-Shanghai-Hangchow, Nanking-Hankow, Nanking-Peking, and Nanking-Chengchow lines.

According to the *Far Eastern Review*, plans are completed for the installation of long-distance telephone services connecting Nanking with Hongkong, Tientsin and Hankow. Construction work on the Nanking-Shanghai line is nearing completion, while the Nan-Fu (Nanchang-Fuchow) and the Peiping-Charhar lines are already in operation. Plans have been devised for the operation of telephone services in the provinces of Kiangsu, Chekiang, Anhwei, Honan, Shantung and Hopei by utilising the telegraph wires and posts. It is also planned to establish a telephone network in the province of Kiangsu, the first stage of the programme being already under way. Radio-telephony will be shortly operating in Nanking, Hankow and Foochow, while an international radio-telephone service will be inaugurated in the near future. Automatic telephones are being introduced in many of the larger Chinese towns, and the Peiping (Peking) Telephone Administration has recently placed an order for 3,000 telephones of the new type.

France.—A TELEPHONE COMPETITION.—The French Post and Telegraph authorities are organising a competition for the best type of pre-payment telephone set for obtaining urban and inter-urban connections from public call boxes. Particulars of the competition, which remains open until July 25th next, can be obtained from the Direction de l'Exploitation Téléphonique, 4e, Bureau, 103, rue de Grenelle, Paris.

Germany.—INCREASES IN POWER.—The Langenberg station is shortly to resume transmissions with the new transmitter with a power of 100 kW. Breslau and Heilsberg are shortly to increase their power to 100 kW, and the 100-kW Munich station will employ its new anti-fading aerial within a few weeks. The Post Office has placed an order for a new 150-kW long-wave station to replace the present " Deutschlandsender."

Great Britain.—RADIO RELAY SERVICES.—With the permission of the Bathgate Town Council, Messrs. Greig Bros. are installing plant for a radio relay service. The firm is forming a company under the title of Greig Relays, Ltd., to conduct a relay business. Messrs. Christy Bros. & Co., Chelmsford, have applied to the Burnham-on-Sea Urban District Council for permission to establish a relay station. The Streets Committee had recommended the giving of permission, with an agreement for eight years, but later a petition was received from local radio dealers disapproving of the proposal, and now the Council, as a Committee, is to meet the firm and the local traders, to discuss the subject.

South America.—WIRELESS CONFERENCE.—The first broadcasting conference in South America was held recently in Buenos Aires under the chairmanship of Senor A. Schroder, the president of the Argentine National Association of Broadcasters, representatives being present from Bolivia, Brazil, Paraguay and Uruguay. The formation of a South American Radiodiffusion Union (Usard), with headquarters in Montevideo, was decided upon, with the object of regulating broadcasting in South America so as to avoid interference. The inaugural meeting of the new Union will be held in Rio de Janeiro next month.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—July 24th. Posts and Telegraphs Department. Enamelled insulated braided switchboard cable. (A.Y. 12396.)*
July 3rd. Insulating tape. (A.Y. 12427.)*
August 14th. Loading coil pots. (A.Y. 12426.)*
City Council. July 16th. Two air filters for turbo-alternators. (G.Y. 13923.)*
July 23rd. State Electricity Commission of Victoria. Two 2,000-kVA three-phase oil-immersed transformers. (A.Y. 12414.)* 11,000-V switchgear and accessories. (A.Y. 12428.)*

Barking.—July 10th. Electricity Department. One new or one second-hand 1,000-kW motor convertor. (See this issue.)

Bexley.—June 27th. Electricity Committee. Underground cables for twelve months ending July 31st, 1935. (June 15th.)

Blackburn.—June 29th. Electricity Department. Three sub-station kiosks, complete with e.h.p. and medium-pressure switchgear. (June 15th.)

Bradfield.—June 30th. Installation of electric lighting at Institution. Forms of tender, &c., from Public Assistance Officer, 1, Abbey Street, Reading.

Bristol.—June 30th. Electricity Department. CO, fire protective equipment. (May 25th.)

Cheadle & Gatley.—June 28th. Electricity Department. 6.6-kV feeder between Cheadle main station and Cheadle Road sub-station. (June 15th.)

Chichester.—June 30th. City Council. Meters, lamps, wiring supplies, joint boxes, cables, cookers, water heaters, &c. (June 15th.)

Congleton.—July 9th. District Joint Hospital Board. Electrical installation at West Heath Sanatorium. (See this issue.)

Dover.—July 20th. Corporation. Complete equipment of two Scott-connected transformer chambers. (June 15th.)

Dundee.—June 25th. Housing Department. Various works, including electric lighting installations, at housing estate. Particulars from City Quantity Surveyor, 21, City Square; tenders to Town Clerk.

Eastbourne.—June 28th. Electricity Department. Street-lighting lanterns and brackets. (June 15th.)

Egypt.—CAIRO.—July 12th. Ministry of the Interior. Material required for the extension of the electrical network at Mehalla el Kobra. (A.Y. 12361.)*
July 17th. Electrical equipment for the supply of power to Chebin-el-Kanater. (A.Y. 12407.)*

Grantown.—June 30th. Town Council. Various works, including electric lighting, at housing scheme. Schedules from T. M. Jaffrey, architect, Grantown-on-Spey (deposit £1); tenders to Town Clerk.

Gravesend.—July 2nd. Corporation. Kiosk and transformer. (See this issue.)

Heston and Isleworth.—June 29th. Electricity Department. 560-V standby battery. (June 8th.)

Hull.—June 25th. City Council. Electric lighting in new garage. Specifications from City Treasurer, Guildhall (£2).

Lancaster.—Electricity Department. E.h.p. switchgear. (See this issue.)

Leyton.—July 9th. Electricity Department. Change-over of supply at the Premier Cinema. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—June 28th. 132,000-V transformers and 66,000-V and low-voltage transformers. (May 25th.)

Manchester.—June 25th. Corporation. Neutral earthing switch cubicles and sub-station kiosk. Specifications from chief engineer and manager, Electricity Department, Town Hall (deposit £1 1s. each.)

New Zealand.—WELLINGTON.—Post and Telegraphs Department. July 3rd. Telephone instrument and switchboard cords. (A.Y. 12363.)*
July 4th. Telephone keys and key-mountings. (A.Y. 12366.)* Metal-cased condensers. (A.Y. 12364.)*
July 24th. 100,000 rubber insulator rings. (F.Y. 2036.)*

Reigate.—July 11th. Electricity Department. E.h.p. and l.p. cables, e.h.p. switchboard cubicles, l.p. disconnecting pillars, and e.h.p. kiosks, transformers, and switchgear. (See this issue.)

Salford.—July 12th. One six-unit, 6,600 V, 100,000 kVA metal-clad switchboard. (See this issue).

South Africa.—CAPE TOWN.—July 18th. Electricity Department. Mercury-arc rectifier equipments and d.c. switchboard. (A.Y. 12417.)*
City Council. July 11th. Electrically operated vehicle-actuated traffic control equipment. (A.Y. 12425.)*
JOHANNESBURG.—July 19th. City Council. Transformers. (A.Y. 12431.)*
WORCESTER.—August 1st. Municipality. Steam turbine, d.c. generator and vertical steam boiler. (A.Y. 12420.)*

Stockton-on-Tees.—Town Council. Electrical installation at the Richard Hind and Hume Street Council Schools.

Stranraer.—July 5th. Town Council. Various works, including electrical fittings, at fifteen blocks of houses. Specifications from A. Maclean Goudie, architect, 30, Lochryan Street (deposit £1); tenders to Town Clerk.

Sutton Coldfield.—June 30th. Public Lighting Committee. Central suspension public lighting. (See this issue.)

Swansea.—July 5th. Electricity Department. One 12,500-kVA 33,000/6,600-V transformer. (See this issue.)

Tain.—June 26th. Town Council. Various works, including electric lighting, at twenty houses. Schedules from J. H. Hinton Gall & Son, architects, 13, Lombard Street, Inverness; tenders to Town Clerk.

Uruguay.—MONTEVIDEO.—July 27th. State Electricity Supply and Telephones Administration. Bare copper conductors and telephone lines. (G. Y. 13853.)*

Wimbledon.—July 4th. Electricity Department. L.p. cables for period ending March 31st, 1935. (See this issue.)

Wolverhampton.—July 2nd. West Midlands Joint Electricity Authority. Two 5,000-kVA, 33/11,000-V transformers, e.h.p. and l.p. cables. (June 8th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Balyoeman.—Accepted. Electrical fittings at housing scheme (£100).—Beveridge Bros.

Barnet.—Hertfordshire County Council. Accepted. Dough-mixing machine for institution (£172).—Peerless Electrical Manufacturing Co., Ltd.

Belfast.—Corporation. Accepted. Cables for the new harbour transmission scheme (£30,371).—W. T. Henley's Telegraph Works Co., Ltd.

Blackpool.—General Purposes Committee. Accepted. Master clock, forty-one clocks and synchronising Town Hall clock.—Synchronome, Ltd.

Bradford.—Electricity Committee. Accepted. D.c. traction swichgear and one 900-kW mercury-arc rectifier for Sunbridge Road sub-station.—English Electric Co., Ltd. One 230-kW mercury-arc rectifier for Pasture Lane sub-station.—Hewittic Electric Co., Ltd.

Dartford.—Electricity Committee. Recommended. Switchgear (£158).—Johnson & Phillips, Ltd.

Dorchester.—Health Committee. Accepted. For Isolation Hospital: Cables (£99).—Johnson & Phillips, Ltd. Wiring, etc. (£123).—R. M. Dawes.

Ealing.—Town Council. Accepted. Re-wiring of Hanwell Library (£196).—Watson & May.

Fife.—Education Authority. Accepted. Electrical fittings at schools.—A. Rutherford.

Government Contracts.—The following contracts were placed by the various Government Departments during May:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Electric batteries.—Chloride Electrical Storage Co.; D.P. Battery Co.
Boxes, switches, &c.—Telford, Grier & Mackay; Whipp & Bourne; Engg. & Lighting Equipment Co.; Wm. McGeoch; Basebe Sadler & Co.
Electric cable.—Connollys; G.E.C.; Hackbridge Cable Co.; Macintosh Cable Co.
Electric capstans.—Sir Wm. Arrol. Sub-contractors: Gilbert Austin for electrical equipment.
Coils.—Marconi's; H. W. Sullivan; Johnson & Phillips.
Condensers.—Telegraph Condenser Co.; Dubilier Condenser Co.; Muirhead & Co.
Electric cranes.—Cowans, Sheldon & Co. Sub-contractors: B.T.-H. for motors; Met.-Vick. Elecl. Co. for control gear; and Pirelli's for cable and link boxes.
Ship ventilating fans.—Veritys. Sub-contractors: Engg. & Lighting Equipment Co.; Small Electric Motors; Allen West & Co.; Mawdsley's; E. N. Bray.
Electric generator sets.—W. H. Allen, Sons & Co.; Peter Brotherhood; English Electric Co.
Motor generators.—Mawdsley's.
Electric motors.—Laurence, Scott & Electromotors.
Switch panels.—Ferguson, Pailin; Bertram Thomas; Whipp & Bourne.
Searchlight projectors.—Laurence, Scott & Electromotors.
Bilge pumps.—Pulsometer Engg. Co. Sub-contractors: Crompton Parkinson; Drysdale & Co.; Sunderland Forge & Engg. Co.; E. N. Bray.
Switchboards.—Whipp & Bourne.
C.o. switches.—Whipp & Bourne; Wm. McGeoch.
Switches.—Veritys; H. W. Sullivan; Ferguson, Pailin; G.E.C.; Wm. McGeoch.

WAR OFFICE.
Cable-laying apparatus.—Siemens Bros.
Batteries and cells.—Pritchett & Gold and E.P.S.
Electric cable.—Enfield Cable Works.
Circuit-breakers.—Crompton Parkinson.
Searchlight lamps.—G. D. Peters & Co.
Headgear receivers.—National Radio Service.
W/t valves.—G.E.C.; Mullard's.

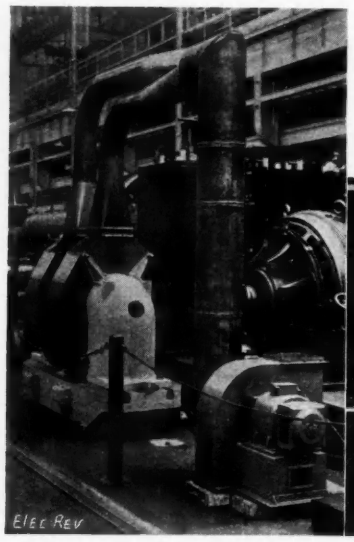
AIR MINISTRY.
Magnetos.—B.T.-H.
Transmitters.—Standard Telephones.
W/t valves.—Ediswan.

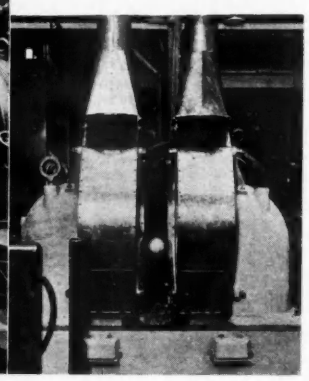
POST OFFICE.
Telephonic apparatus.—Automatic Electric Co.; Thos. De La Rue; Ericsson Telephones; G.E.C.; Standard Telephones.
Wireless apparatus.—R.I., Ltd.; Walter's Electl. Mfg. Co.
Electric lamps.—G.E.C.
Cable.—Callender's; Connolly's; G.E.C.; W. T. Glover & Co.; Hackbridge Cable Co.; Macintosh Cable Co.; Pirelli's; Siemens Bros.; Standard Telephones.
Leclanché cells.—Grosvenor Electric Batteries.
Loading coils.—Standard Telephones.
Telephone cords.—L.P.S. Electrical Co.

Electric lighting fittings.—Hailwood & Ackroyd; Veritys.
Copper wire.—Pirelli's.
Flameproof wire.—G.E.C.; Macintosh Cable Co.
Electric lifts.—Evans Lifts, Ltd.; Wm. Wadsworth & Sons.
Electric lighting.—G. McCartney & Co.

Telephone exchange equipment.—Wrexham (new auto exchange); Stratford-on-Avon (power plant).—Automatic Electric Co. Sub-contractors: Alton Battery Co. for batteries; Electric Construction Co. for generator. Holborn (London).—Automatic Electric Co. King's Lynn (power plant).—Ericsson Telephones. Sub-contractors: Chloride Electl. Storage Co. for batteries; Electric Construction Co. for generator and ringing machines. Euston (London), (new auto exchange); Trafford Park (Manchester), (power plant).—Ericsson Telephones. Sub-contractors: Pritchett & Gold and E.P.S. Co. for batteries; Electric Construction Co. for generator and ringing machines. Hurstway (London), (power plant); Hull (power plant).—G.E.C. Sub-contractors: D.P. Battery Co. for batteries; Crompton Parkinson for generators; W. Jones & Co. for ringing machines. Knock (Belfast), (power plant).—Siemens Bros. Sub-contractors: Chloride Elecl. Storage Co. for batteries; Electric Construction Co. for generator and ringing machines. Chertsey (London), (new unit auto exchange); Leith (Edinburgh), (new auto exchange); Stepney (London), (new auto exchange); Birmingham; Bristol (private branch exchange extension); Grimsby.—Siemens Bros. Oxford.—Standard Telephones. Sub-contractors: Chloride Elecl. Storage Co. for batteries; Electric Construction Co. for generators; W. Jones & Co. for ringing machines. Fulham (London).—Standard Telephones.

Voice frequency telegraph equipment.—Bristol, Plymouth, Cardiff, London, and Southampton.—Standard Telephones.





Left: The complete magnet and blower on test. Right: A hollow aluminium ball shown falling slowly through the field, the intensity of which induces currents of such strength in the ball that it falls as though immersed in a viscous fluid

Repeater station equipment.—Manchester.—Standard Telephones.

CROWN AGENTS FOR THE COLONIES.

Automatic telephone apparatus.—G.E.C.
Cable, &c.—Siemens Bros.; Standard Telephones.
Copper wire.—Whitecross Co.; T. Bolton & Sons.
Generating set.—Belliss & Morcom.
Insulators, telephone arms, &c.—Bullers, Ltd.
Lamps.—G.E.C.
Meters and spares.—Ferranti, Ltd.
Telegraph ironwork.—Siemens Bros.
Telephones.—G.E.C.
Transmitters.—Marconi's.

Greenford.—Ealing Education Committee. Accepted. Electrical wiring of Ravenor School (£391).—Harris & Gubbins.

Houston.—Renfrew County Council. Accepted. Electrical work in sixteen houses at Crosslee.—J. Ball & Sons.

Hyde.—Accepted. Electric lighting improvements at Town Hall.—E. Page.

London.—Metropolitan Water Board. Accepted. Cable, &c., for Deptford works (£109).—W. T. Glover & Co., Ltd. Electric motor for Surbiton works (£83).—British Thomson-Houston Co., Ltd. Four portable floodlights for Barnes works (£104), and electric circulating water pump for Battersea works (£80).—General Electric Co., Ltd.

FULHAM.—Electricity and Lighting Committee. Recommended. Wiring of premises for lighting and heating (schedule prices).—E. Dyne & Co., Ltd.; J. Hammond; E. G. Hill; Piggot Bros. & Co., Ltd.; D. W. Prentice; W. B. & H. C. Cables, Ltd.

L.C.C.—Recommended. Wiring and fittings for electric lighting in dwellings at Shoreditch (£398).—Electrical Installations, Ltd.

South Shields.—Electricity Committee. Accepted. 1,000-kW rotary convertor (£2,109).—Metropolitan-Vickers Electrical Co., Ltd.

Swansea.—Civic Centre Committee. Accepted. Electric clocks (£329).—Gent & Co. Electric wiring (£188).—Cash & Co. Electricity Committee. Accepted. Transformers.—Hackbridge Electric Construction Co., Ltd. Feeder pillars.—Lucy & Co. Lighting brackets.—Wardle Engineering Co.

Whitby.—Electric Lighting Sub-Committee. Recommended. Transformer equipment (£449).—Crompton Parkinson, Ltd.

Wrexham.—Town Council. Accepted. Wiring twelve flats at Acton for electric lighting (£150).—S. Thornton.

Notes

"Daylight" Lamps in the Textile Industry

The satisfactory lighting of the field of operations involved in the textile process of "drawing-in" has presented a difficult problem, and whenever the lighting was rearranged the operatives complained of headaches, resulting in reduced earnings and output. The effects of eye-strain are intensified when coloured cotton, art silk or rayon yarns are used on account of the high reflecting power of the threads. With clear or internally frosted lamps it is difficult to see faults quickly and easily, but experiments with "daylight" lamps have much improved the lighting. Osram "daylight" lamps have also been found suitable for mixing cotton, enabling variations in colour to be easily distinguished.

Educational

A prospectus of degree courses in technology at the University of Manchester is now available.
(See our classified advertisements.)

A Large Experimental Electro-magnet

What is claimed to be the largest electro-magnet ever made in this country for purely experimental work has just been completed in the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. It has been made to the order of Prof. P. M. S. Blackett, Professor of Physics at Birkbeck College in the University of London. While there are magnets in existence that will give a more intense magnetic field over a short air gap of small area for a short time, this magnet will give a flux density of 10,000 gauss in an air gap 15 cm. long between pole faces 25 cm. in diameter when working continuously at its normal rating of 6¼ kW. Further this power may be increased to 25 kW for special purposes, when the flux density would be increased by 25 per cent. In order to obtain these flux densities 122,500 ampere turns are necessary at the normal rating and 245 ampere turns for the higher rating.

The heat generated in the specially designed exciting coils, which are wound in flat sections, is dissipated by air drawn through the casing which encloses them. The gap between the pole faces can be varied from zero up to 20 cm. by a screw mechanism. The magnet is mounted on small roller wheels to enable it to be moved easily in the absence of cranes or other lifting mechanism, which are not available in the laboratory. The complete magnet weighs approximately 11 tons. The data for its design have been collated in the company's Research Department and the entire plant is designed to give exactly the required characteristics.

The measurements of deviations of cosmic rays which are to be made in the magnetic field will be of a very delicate character. The control of the exciting current for the magnet is through a switch panel which provides means for varying the strength of the magnetic field, and arrangements have been made for preventing a rise in voltage, due to the highly inductive nature of the load, on breaking the circuit.

Lamp Efficiencies

An adjourned summons against Messrs. F. W. Woolworth & Co. accusing them of selling lamps to which a false trade description was applied was dismissed on Tuesday by the Southend magistrates, who awarded £10 10s. costs to the company. The complainant, Mr. John Harrison, said that eight 5-W lamps and four 10-W lamps purchased by him from the defendants gave on test higher wattages than those stated. He was, however, unable to produce a receipt for the purchase of the lamps referred to. Mr. W. D. Martin, an assistant at Faraday House, said he had tested, at 230 V, seven lamps received from the complainant and found that the wattages were 19.8, 12.5, 12.9, 13, 18, 20 and 16.1. He very rarely found that lamps failed to give the wattage specified. The magistrates stopped the proceedings without calling upon the defence.

Forthcoming Events

Electrical Contractors' Association.—June 27th.-29th. Buxton. Annual conference.

Junior Institution of Engineers.—June 27th-29th. London. Fiftieth anniversary celebrations.

Institution of Electrical Engineers.—Wednesday, July 11th. Institution, London. Conversazione for overseas members. (*South Midland Centre*).—Wednesday, July 4th. Summer meeting. Visit to Callender's Cable Works.

Makers' Names Wanted

BECHLER high-precision automatic machine.
WALLINE skirting heaters.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. B. G. Gates, whose article on "Tertiary Windings" appears in this issue, is an A.M.I.E.E., and between 1921 and 1924 studied at the City and Guilds (Engineering) College, where he became B.Sc. (1st Cl. Hon.) in electrical engineering, A.C.G.I. and D.I.C., and was awarded the Siemens Medal for electrical engineering and the Henrici Medal for mathematics.

[*Elliott & Fry*
Mr. B. G. Gates

In 1924 he entered the employment of Messrs. Johnson and Phillips, Ltd., spending two years as college apprentice and afterwards being appointed designer in the Transformer Department. For a short time in 1928 he acted as research assistant in the High Voltage Laboratory of the Metropolitan-Vickers Electrical Co., Ltd., but later that year he joined the British Electric Transformer Co., Ltd., Hayes, as one of its chief technical engineers, doing a considerable amount of work in connection with the grid. He was also largely responsible for the development of the toroidal reactor and other devices. Last year he was appointed to the technical staff of the E.R.A.

Mr. George Wilkinson, M.I.E.E., &c., of Harrogate, asks us to state that in order that he may be able to devote attention to the problems of diversity and load factor in connection with public electricity supplies he has resigned his membership of the Association of Consulting Engineers.

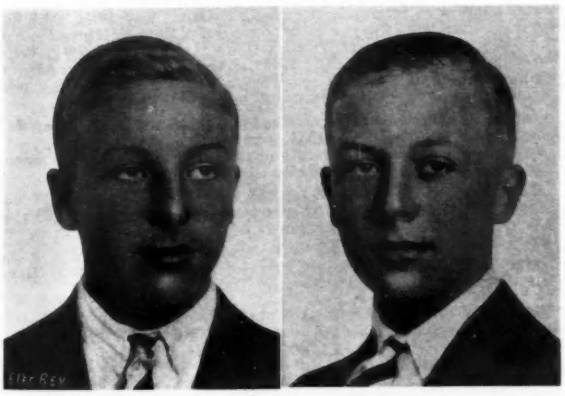
Mr. F. W. Mills, formerly chief electrical engineer of the South African Government Railways, recently arrived in England on a six months' visit.

Mr. T. H. Timms, of Wolverhampton, has been appointed meter superintendent to the Lincoln Corporation Electricity Department.

Mr. E. J. Shuter has been awarded the first prize and **Mr. E. H. Whatton** the second, for the 1933-34 session, as a result of the decision of the judges appointed for the meetings discussion award of the Association of Supervising Electrical Engineers.

Mr. A. Newing, A.M.I.E.E., of Dashwood, The Chenies, Petts Wood, near Orpington, was married recently to Miss Dorothy Wraight, of Gravesend.

Mr. I. S. Plumtree has resigned his position as Midland representative with Messrs. Belling & Co., and will shortly join the staff of Messrs. Albert Phillips, Ltd., whom he will represent in the Midland area, which includes Sheffield and district.



Messrs. J. A. and C. G. Collis, who have been appointed directors of the Standard Switchgear Co. (See page 912)

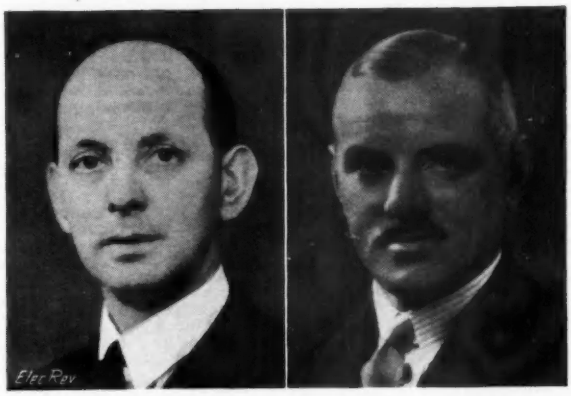
In our last issue we announced that **Mr. R. H. Schofield** had been appointed to the board of Messrs. Ferranti, Ltd., and that **Mr. C. W. Bridgen** was to succeed him as general sales manager to the company. We now have pleasure in reproducing the portraits of these gentlemen.

Mr. T. G. Martin has been appointed London sales engineer for Messrs. Evans Lifts, Ltd., of Leicester. His office is at 66, Victoria Street, S.W.

Mr. Croom-Johnson has been appointed to British Permel Enamelled Wire, Ltd. His office is at Granville House, Arundel Street, Strand, W.C.2.

Mr. A. Bailes has resigned his position as lamp sales superintendent to Messrs. H. C. Rawson (Sheffield & London), Ltd., and is taking up a position with the sales staff of the Nox Electric Lamp Co., Ltd., Hunslet, Leeds.

Mr. J. G. Everett, for many years representative for the Hart Accumulator Co., Ltd., in the South Coast area, has joined the staff of Messrs. Baxter & Caunter, Ltd., and will represent them in that territory.



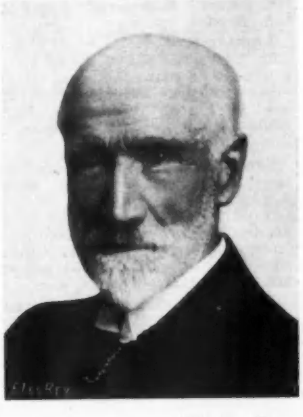
Mr. R. H. Schofield **Mr. C. W. Bridgen**

Mr. C. J. Spencer, resident director of the North Metropolitan Electric Power Supply Co., has returned to London from South Africa, where he was chairman of the committee of inquiry which has been investigating the Johannesburg municipal transport system. He was accompanied to London by **Mr. L. M. Barry**, manager of the Johannesburg tramways department, who has been sent by the City Council to purchase a number of new omnibuses at a cost of £72,000. Mr. Spencer will act with Mr. Barry in considering the tenders for these vehicles.

Obituary

Mr. J. Ramsay.—The death is announced, at the age of sixty-six, of Mr. John Ramsay, who was for a long period principal of Messrs. Ramsay Bros., electrical and general engineers, of the Phœnix Foundry, Whitehaven.

Mr. J. P. Hall.—The death occurred on June 10th, at Ashton-on-Clun, of Mr. Joseph Platt Hall, in his seventieth year. He was associated with the electrical industry for nearly fifty years, and for over thirty-five years was the head of Messrs. J. P. Hall & Co., Ltd., electrical engineers of Oldham, retiring several years ago.



[*Elliott & Fry*
Mr. J. J. Fahie, whose death was recorded in our last issue

Wills.—**Mr. A. Mikellatos**, a director of the Dubilier Condenser Co. (1925), Ltd., and of the Mansbridge Condenser Co., Ltd., left £275,998 (net personalty £149,729).

Sir George Sutton, Bt., of W. T. Henleys Telegraph Works Co., Ltd., left £360,465 gross and £349,869 net personalty. In addition to large sums left to hospitals and other charities, he bequeathed £1,000 to the Benevolent Fund of the Institution of Electrical Engineers and £1,000 to the Electrical Industries Benevolent Institution, of which he was a past-president. A gift of £1,000 to the Royal National Lifeboat Institution may be regarded as an expression of admiration he and a number of his early contemporaries felt for such organisations through personal knowledge of the risks attending the work of submarine cable-laying. Sir George left the gold casket presented to him by the staff in 1931 as an ornament for the Henley board table "at which I have sat for fifty years."

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Broughton Products, Ltd.—Private company. Registered June 15th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with B. J. Broughton and J. Sorrell and to carry on the business of radio, electrical, automobile, hydraulic, mechanical and mining engineers and manufacturers, &c. The first directors are: B. J. Broughton, 10, Victoria Road, Clapham, S.W.4, and J. Sorrell, 152, Charles St., Commercial Road, E.1. Registered office: 10, Victoria Road, Clapham, S.W.4.

Grant & Mills, Ltd.—Private company. Registered June 15. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, mechanical, aeronautical, motor and consulting engineers, &c. The directors are: V. D. Grant, "Morven," Chester Road, Streetley, and R. W. H. Mills, 149, Birmingham Road, Wylde Green. Registered office: 9 & 11, Park Road, Hockley, Birmingham.

Plew Television, Ltd.—Private company. Registered June 15. Capital, £10,000 in £1 shares (4,700 "A" ordinary and 5,300 "B" ordinary). Objects: To carry on the business of manufacturers of and dealers in television and wireless apparatus, gramophones, &c. The directors are: C. J. S. Norris, 26, Elm Bank Mansions, Barnes, S.W.13, and E. W. Workman, 130, Horseferry Road, S.W.1. Registered office: 14, Dover Street, W.1.

Chorley Radio Relay Service, Ltd.—Private company. Registered June 13. Capital, £2,150 in 2,000 7 per cent. cumulative preference shares of £1 each, and 3,000 ordinary shares of 1s. each. Objects: To enter into an assignment between Broadcast Relay Service, Ltd., of the first part, the Borough of Chorley of the second part, and the company of the third part, and to carry on the business of relayers of wireless and radio entertainment programmes, &c. The permanent directors are: W. H. Shipley, 11, Roman Avenue, Roundhay, Leeds, and three others. Registered office: 59. St. Thomas's Road, Chorley, Lancs.

Commercial Telephone Co., Ltd.—Private company. Registered June 16th. Capital, £2,000 in £1 shares (1,250 ordinary and 750 deferred). Objects: To carry on the business of manufacturers, importers, exporters and repairers of and dealers in telephone apparatus and electrical goods, &c. The directors are: B. Jutsum (permanent managing director and chairman), St. James Chambers, 1-3, St. James' Barton, Bristol, and three others. Solicitors: Sheppard, Norcott & Co., Bristol.

Novodyne Products, Ltd.—Private company. Registered June 15th. Capital, £15,000 in 2,500 "A" 6 per cent. non-participating cumulative preference and 8,000 "B" 6 per cent. participating preference shares of £1 and 18,000 ordinary shares of 5s. each. Objects: To acquire the business of manufacturers of radio and electrical components and products carried on by A. G. Prudden and R. W. Emerson at 3, St. Ann's Terrace, St. John's Wood, N.W.8. The directors are: R. W. Emerson, 3, St. Ann's Terrace, St. John's Wood, N.W.8, and two others. Secretary: Jeanne Cameron. Registered office: 16a, High Road, Lee, S.E.13.

H. G. Weaver, Ltd.—Private company. Registered June 13th. Capital, £2,300 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers and retailers of electrical goods, &c. The subscribers are: H. G. Weaver, 170, Coldharbour Road, Bristol, who signs documents as director, and two others. Registered office: 22, Princess Victoria Street, Clifton, Bristol.

Luminous Signs, Ltd.—Private company. Registered June 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in neon and other electric signs, lamps, and apparatus, &c. The first directors are: L. Murphy, Maesmor, East Horsley, Surrey; and A. R. Rangabe, 37, Cranley Gardens, S.W.7. Registered office: 5/11, Theobald's Road, W.C.1.

Freeborn Power Converters, Ltd.—Private company. Registered June 11th. Capital, £4,500 in £1 shares. Objects: To acquire any patents and to carry on the business of manufacturers of and dealers in plant, machinery, apparatus and appliances for power conversion and the distribution and transmission of power, &c. The first directors are: R. Annan, 38, Orchard Court, W.1, and two others. Registered office: 49, Moorgate, E.C.2.

Edwards & Co. (Twickenham), Ltd.—Private company. Registered June 11th. Capital, £2,000 in £1 shares. Objects: To acquire the business of electrical engineers carried on by Mrs. B. M. L. Denny and Edward Firth, at 36, Orleans Road, East Twickenham, Middlesex, as "Edwards & Co." The permanent directors are: Mrs. Beatrice M. L. Denny (chairman), 3, Clevedon Mansions, Richmond Bridge, East Twickenham; and E. Firth, 32, Mount Ararat Road, Richmond, Surrey. Registered office: 36, Orleans Road, East Twickenham, Middlesex.

Kirkby Radio Rediffusion, Ltd.—Private company. Registered June 11th. Capital, £1,500 in £1 shares. Objects: To acquire the business of relaying wireless programmes carried on by Harry Thorpe, trading as the Kirkby Radio Rediffusion at Kirkby-in-Ashfield, Notts. The directors are: H. Thorpe, 31, Milton Street, East Kirkby, Notts; and J. G. Coates, 5, Brentwood Avenue, Burnley. Registered office: 26, Bridge Street, Burnley.

Halson Radio Co., Ltd.—Private company. Registered June 4th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless and electrical apparatus, &c. The first directors are: George Hyman and Mrs. Maidie Hyman, both of 36a, Bruton Place, W.1. Registered office: 36a, Bruton Place, W.1.

Edgbaston Radio and Electric Co., Ltd.—Private company. Registered June 12th. Capital, £2,000 in £1 shares. Objects: To carry on the business of wireless engineers, manufacturers and salesmen, &c. The first directors are: T. G. Arnold (permanent governing director and chairman), Ash Grove, Warwick Road, Solihull, Birmingham; and S. Arnold, 484, City Road, Edgbaston, Birmingham. Registered office: 11 and 12, Bennett's Hill, Birmingham.

British Electric Hydrators, Ltd.—Private company. Registered June 8th. Capital, £200 in £1 shares. Objects: To carry on the business of electrical engineers, mechanical engineers and manufacturers, manufacturers of and dealers in electrical laundry machinery, electrical household utensils, electrically operated washing machines, wringing machines, boilers, electric ironing apparatus, workers and dealers in electricity, &c. The first directors are: C. E. Ososki, 400, Ecclesall Road, South Sheffield, and two others. Registered office: 33 and 35, Paradise Street, Sheffield.

Ballybunion Electricity Supply Co., Ltd.—Private company. Registered in Dublin June 13th. Capital, £2,000 in £1 shares. Objects: To carry on at Ballybunion, Co. Kerry, the business of an electricity supply company in all its branches, &c. The first directors are J. Clarke, Ballybunion, Co. Kerry, and three others.

Radio Listeners, Ltd.—Public company. Registered June 7th. Capital, £15,000 in 12,000 7 per cent. cumulative participating preference shares of £1 each and 12,000 ordinary shares of 5s. each. Objects: To adopt an agreement with Radio Relay Services (Shoreham-by-Sea), Ltd., to acquire and develop the business comprised therein, and to carry on the business of wireless engineers, designers, fitters and manufacturers, &c. The first directors are: P. E. Barratt, "Lalerne," Beach Road, Shoreham-by-Sea, and two others. Thomas W. Fassett, 8/10, East Street, Shoreham, engineer. Registered office: 8/10, East Street, Shoreham, Sussex.

Returns of Electrical Companies

Marlborough Electrical Co., Ltd.—Debenture charged on the company's undertaking and property, including uncalled capital, and patents dated May 31st, 1934, to secure all moneys due or to become due from the company to the Royal Bank of Scotland.

Batterby & Hefford, Ltd.—Particulars filed of £280 debentures, authorised May 10th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the whole amount being now issued.

Blandford Radio, Ltd.—Debenture dated May 15th, 1934, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. A. Beeny, Epsom Road, Merrow, Guildford.

Butlers Radio, Ltd.—Second debenture, dated June 4th, 1934, to secure £95, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Le Boutillier, 219, Forest Road, Walthamstow, E.

Neon Installations, Ltd.—Debenture dated June 8th, 1934, to secure £400, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. E. Josephs, 5, Wycombe Gardens, Finchley Road, N.W.11.

Gardner's Radio, Ltd.—Debenture dated May 23rd, 1934, to secure £500, charged on the company's property, present and future, including uncalled capital. Holder: A. Gardner, 21, Saxonbury Road, Southbourne, Bournemouth.

Newman, Sons & Co., Ltd.—(A) Mortgage on Poole Court, Yate, Glos, and land adjoining, &c., dated May 19th, 1934, to secure all moneys due or to become due from the company to the Midland Bank, Ltd. (B) Particulars filed of £7,500 debentures authorised May 28th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Berry & Wilson, Ltd.—Satisfaction on May 9th, 1934, of debenture dated April 27th, 1933, and registered April 28th, 1933. (According to the register of mortgages, the debenture registered April 28th, 1933, originally secured £200.)

Cunningham Beard & Co., Ltd.—W. Nicholson, 12, Wood Street, E.C., was appointed receiver and manager on June 7th, 1934, under powers contained in debentures dated November 27th, 1931.

Manor Radio, Ltd.—S. G. Crimes, 150, Southampton Row, W.C.1, ceased to act as receiver on June 7th, 1934.

Hartland Electric Light & Power Co., Ltd.—Capital, £2,000 in £1 shares. Return dated January 13th, 1934. 1,800 shares taken up. £1,700 paid. £1,000 considered as paid. Mortgages and charges, nil.

Nunnery Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated February 19th, 1934. 401 shares taken up. £401 paid. Mortgages and charges, nil.

Claude-General Neon Lights, Ltd.—Issue on May 14th, 1934, of £4,500 debentures, part of a series already registered.

Aero-Electrical Equipment Co., Ltd.—The nominal capital has been increased by the addition of £15,000 beyond the registered capital of £10,000. The additional capital is divided into 30,000 7½ per cent. preferred ordinary (not redeemable) shares of 10s. each.

Swindon Radio Relay Exchange, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 5th, 1934, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Burchnell's Battery Service, Ltd.—Debenture charged on contract to purchase 102, High Street, Old Fletton, Hunts, and the company's undertaking and other property, present and future, including uncalled capital, dated March 23rd, 1934, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Northern Telephone & Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated February 14th, 1934. 210 shares taken up. £210 paid. Mortgages and charges, nil.

Rutland Electric Lamp Co., Ltd.—Capital, £500 in £1 shares. Return dated February 24th, 1934. 100 shares taken up. £100 paid. Mortgages and charges, nil.

"P. & B." Engineering Co., Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £3,000. The additional capital is divided into 2,000 6 per cent. non-redeemable preference shares of £1 each.

Grovelands, Ltd.—Capital, £1,000 in £1 shares. Return dated January 2nd, 1934. All shares taken up £1,000 paid. Mortgages and charges, nil.

Universal Lamp Co., Ltd.—With reference to the notice appearing on p. 886 of our last issue regarding the increase of capital by £2,500, the company states that 2,493 £1 ordinary shares were purchased and paid for in cash.

City Notes

The General Electric Co., Ltd., reports a profit for the year ended March 31st last of £971,481, as compared with £1,012,739 in the preceding year, to which is added £421,246 brought in, making £1,392,727 available. After deducting debenture interest (£163,673), depreciation (£233,590), directors' remuneration (£4,355), and contribution to pension fund (£35,378), meeting the preference dividend and placing £100,000 to reserve (against £137,750), there is an available balance of £603,730. It is proposed to maintain the ordinary dividend for the year at 8 per cent. and to carry forward £423,438. The report states that the period under review has been one of exceptional difficulty, both at home and overseas, though there were signs of improvement in the later months. The volume of the company's export business has shown a steady increase, though it is still below normal. Adverse conditions have continued to affect the trading of the overseas branches, but a definite improvement has occurred in Australia and South Africa. The works have, on the whole, been well employed, but in the heavy engineering and telephone departments the volume of incoming orders was not satisfactory, though an increase took place during the latter part of the year. At March 31st the company's liquid resources amounted to £2,326,000, an increase of £305,000 over the previous year. The number of employés was 24,235, an increase of 1,532 as compared with 1932-33. The assets of the contributory pension fund, originated by the company fourteen years ago, now exceed £1,000,000. With the report the company has issued a booklet briefly outlining the progress made during the year, and drawing attention to several developments, following research during preceding years. A number of illustrations of installations carried out by the company are included. Meeting June 28th.

S. Smith & Sons (Motor Accessories), Ltd.—Separate general meetings of the holders of the 7 per cent. non-cumulative preferred ordinary and deferred ordinary shares and an extraordinary general meeting were held on June 15th at which resolutions were approved authorising the issue of 100,000 of the unissued ordinary shares of £1 each as 7 per cent. non-cumulative preferred ordinary shares and sub-dividing 28,000 of the unissued ordinary shares of £1 each into 20 shares of 1s. each and converting the resulting 560,000 shares into deferred ordinary shares. Mr. W. Henderson-Cleland (chairman), who presided, said they had decided to issue to shareholders the preferred ordinary shares at 30s. each and the deferred ordinary shares at 3s. each. Since the last annual meeting the expansion of their business had been substantial, and it became necessary to take immediate steps to increase their manufacturing facilities. In the last three years they had helped to establish an entirely new industry—the development of their domestic clock business. They had built and equipped a new factory for the manufacture of escapements at the Chronos Works. The development of these new productions had necessitated the forming of separate selling companies, and while they had hoped that they would be able to cope with the demand with their existing plant, they had found that this was no longer possible. The time had now come when they must amplify their resources.

John Ismay & Sons, Ltd., held their first annual meeting on June 15th, when Mr. J. Ismay (chairman and managing director), who presided, said that during the year they had formed a subsidiary company for the manufacture of neon lighting tubes which had now passed the development stage and was on a paying basis. They had recently acquired a large interest in the business of H. C. Rawson (Sheffield and London), Ltd., who manufactured, in addition to distributing, domestic electrical appliances. That company had depôts in various towns in the Midlands and North and did a large turnover in the radio and allied trades. One of their interests was the Halcyon Radio Co., which had recently introduced a new model that had been well received. The company was also interested in television which it intended to develop. It was proposed to enlarge and develop the business of the company, and the board was satisfied that their new ventures had great potential earning capabilities. They were also negotiating to take over other interests, and the additional money necessary to finance these developments would be raised by a capital issue.

W. T. Henley's Telegraph Works Co., Ltd., reports a profit for the year ended March 31st last of £279,424, as compared with £300,298 in the preceding year. After deducting directors' and auditors' fees, debenture interest, &c., and adding £516,901 brought in and £1,516 transferred from reserve against trustee securities, there is a total of £728,291. As announced in our last issue, the final ordinary dividend is 2s. 6d. per share, maintaining the ordinary distribution at 4s. per share, and it is again proposed to pay a cash bonus of 2s. per share, leaving £473,454 to be carried forward. The company's subsidiary, Henley's Tyre & Rubber Co., Ltd., has made a profit, after taking into account a reserve which was no longer required. No part of this profit has been brought into the accounts of the parent company. The report records the death of the president, Sir George Sutton, Bt., and the appointment of Messrs. J. Lamont and W. McLelland to the board. Meeting: To-day (Friday).

Hick, Hargreaves & Co., Ltd., report a trading loss for the year ended March 31st last, of £217, and after providing for depreciation, debenture interest and income tax, there is a net loss of £6,796. A balance of £1,539 is brought in and £7,000 is transferred from reserve, leaving a credit balance of £1,743. It is proposed to pay a dividend of ¼ per cent. and to carry forward £543. The report states that the year has again been one of extreme difficulty, the turnover being the lowest on record in the post-war period. There has, however, been a substantial increase in the value of the contracts secured during the year, and the outlook has definitely improved since the commencement of 1934.

The Lisbon Electric Tramways Co., Ltd., reports that after providing for debenture service and interest charges in connection with the Portuguese subsidiary there is a profit for 1933 of £177,620, as compared with £169,168 for 1932, which with £38,803 brought in makes £216,424. It is proposed to pay a final ordinary dividend of 4½ per cent., making 7½ per cent. for the year (against 7 per cent.), and to carry forward £46,062. The number of passengers carried totalled 118,810,509 (118,725,708 in 1932).

Ward & Goldstone, Ltd., report a profit for the year ended March 31st last of £28,460, as against £26,083 in the preceding year. After deducting directors' fees, income tax and depreciation, and adding £23,140 brought in, it is proposed to pay an ordinary dividend of 10 per cent., and to carry forward £28,179. The report states that competition during the year was very severe, but the turnover and output were well maintained.

La Plata Electric Tramways Co. reports gross receipts of £122,821 for 1933, and net receipts of £23,815, as against £21,268 in 1932. After deducting exchange losses, debenture interest, &c., and adding £17,653 brought in, there is a total of £32,594 available. From this £12,000 has been placed to renewals and reserve, and £20,594 is carried forward.

James Keith & Blackman Co., Ltd., report a net profit for the year ended March 31st last of £15,069, as compared with £13,348 for the preceding year, to which is added £11,255 brought in, making £26,324. It is proposed to pay a dividend of 9 per cent. on the ordinary shares (against 8 per cent.) and to carry forward £10,263.

The Victoria Falls & Transvaal Power Co., Ltd., has declared a final ordinary dividend of 12 per cent., making 15 per cent. for 1933, and a bonus of 5 per cent. payable out of the balance of exchange credited to No. 2 reserve fund at December 31st, 1932 (unchanged).

The British Aluminium Co., Ltd.—The subscription list was opened on June 19th for the issue of 500,000 6 per cent. cumulative preference shares of £1 each at 24s. 6d. per share, 998,966 ordinary shares of £1 each at 27s. 6d. per share and £1,000,000 of 4 per cent. mortgage debenture stock at 99 per cent. The proceeds will be applied in the redemption of the 4½ per cent. guaranteed debenture stock of the North British Aluminum Co., Ltd., to meet the cash payment to be made under the debenture stock conversion offer, and towards the general requirements of the company. The list was closed on the same day, being over-subscribed.

Mirrlees, Bickerton & Day, Ltd., report a net profit for the year ended March 31st last of £13,097, as against £12,679 for 1932-33. The ordinary dividend is maintained at 3 per cent. and £7,496 is carried forward.

Greenwood & Batley, Ltd., have announced an ordinary dividend of 3½ per cent. for the year ended March 31st last (against 2½ per cent. for 1932-33).

The London Electric Wire Co. & Smiths, Ltd., has announced an interim ordinary dividend of 1¼ per cent. (same).

Stocks and Shares

TUESDAY EVENING.

CAPITAL is returning to the Stock Exchange markets notwithstanding the proximity of the June window-dressing time. It is said, moreover, that some of the money is on account of foreigners who realise the security which British investments offer as compared with those in their own parts of the world. The latest developments in connection with the proposed German moratorium, the strike influence in America, and the incessant reminders of exchange difficulties that prevail in countries outside Great Britain, are all in themselves advertisements of the strength of Great Britain's position, both as regards her national securities, and those of her established industries. Whatever may be the reason—and these causes are certainly amongst the most important which operate at the present time—the fact remains that the prices of gilt-edged stocks and good industrial shares reflect a steady investment of capital. This in itself is an encouragement to further purchases on behalf of people who, having money, are uncertain whether to spend it in stocks and shares or to place it upon deposit at some negligible rate of interest with the Banks.

London Passenger "C"

The various issues of the public boards connected with electrical services show no change other than an improvement of a point in London Passenger Transport "C" stock. This latter has recovered to 74½. It is, of course, the only speculative member of the group. Prices have varied this year between extremes of 85¾ and 72½. Until the promised dividend declaration is made next month, holders of stock feel that

they are in the dark as to the kind of return they are likely to receive from their investment.

The market for Cables and Wireless stocks shows a recovery from its recent weakness, there having been a little support of the 2¾ per cent. preference stock. This had the effect of putting up the price a couple of points to 67½. Sympathetically, the "A" ordinary advanced to 15½. These improvements did not prevent, however, a further decline in Globe ordinary, to 8¼. Anglo-American Telegraph stocks are dull, and Great Northerns have failed to recover from the fall which left them at 38 a week ago.

General Electrics

A slight decline in the price of General Electric ordinary shares does not in any way imply dissatisfaction with the results shown in the company's annual report, just out. The profits are £41,000 down, but this, on a total amount of £971,000, is of no great consequence. The ordinary dividend is maintained at 8 per cent., and the reserve is brought up to £1,600,000, the carry-forward being £423,000. The strength of the financial position can be gauged by the cash and investments, which come to £2,326,000, some £300,000 more than the total of a year ago.

Aron Meters have come into prominence during the past few days with a rise from 52s. 6d. to 55s. 6d., reverting to 54s. 6d. on a little profit-taking. Associated Electrical Industries ordinary are better at 18s. 3d. The Kolster-Brandes capital of £1,160,000 in shares of £1 each is to be reduced by approximately 14s. per share. Last year's figures showed a loss of £150,000. For these shares, when they were first issued, it may be recalled, there was a lively demand, and the price rose to 2½. London Electric Wire Co. & Smith's ordinary shares are to receive 1¼ per cent. interim dividend, the same as that of a year ago. The price of the ordinary is 20s., and the preference 27s.

Manufacturing and Equipment

Henleys at 5⅞ have recovered the setback of 2s. 6d. that occurred upon announcement of the dividend. The latter, making the now usual 30 per cent. for the year, was welcomed as an excellent performance. Temporary dullness in the price of the shares is thought to have been due to apprehension lest shares might come to market from deceased accounts. Even if they were to do so, there is ample absorption-power nowadays apparent for first-rate industrials. Callenders remain at £3, ex the recently declared dividend. A rise of 5 points in Edison Swan 5 per cent. first debenture lifted the price to 107½. Siemens strengthened to 17s. 6d. Telegraph Constructions have fallen away to 20s. British Aluminium shares are unaltered at 28s. 3d. The company has been offering this week half-a-million 6 per cent. preference shares of £1 each at 24s. 6d., a million pounds 4 per cent. debenture stock at 99, and 998,966 ordinary shares of £1 each at 27s. 6d. The ordinary shares, it will be noticed, are offered at a price but little below the 28s. 3d. quoted in the market for the existing shares. The 6 per cent. preference stand at 25s. The 5 per cent. first mortgage debenture stock, which it is proposed shall be repaid out of the present issue, is about 106, with an interest payment due this month. The latter stock is to be paid off on January 1st next, and a month later the company will redeem £2,248,000 of 4½ per cent. debenture stock of the North British Aluminium Company, issued under the Trades Facilities Acts.

Dollar Stocks

The Brazilian Traction Light & Power Company has issued its twenty-first annual accounts. These show a net revenue of 3,400,000 dollars, a reduction of 1,800,000 dollars, as compared with 1932-3. The figures have had no effect upon the price of the shares, the latter sharing in the better tendency recently exhibited by dollar stocks; at 9⅞ the price is ¼ higher on the week. Americans are coming a little more into favour, more particularly those in the industrial market. American Telephone & Telegraph, for instance, at 116¼, show a gain of 3 points. The company has declared its usual quarterly dividend at the rate of 9 per cent. per annum, payable on the 16th of next month.

Miscellaneous Matters

The Lisbon Electric Tramways Company issues a satisfactory report, showing an increase in the net profit, and an improvement of 10s. per cent., to 7½ per cent. net, in the dividend. The ordinary shares are unchanged at 27s. 6d. Yorkshire (West Riding) Electric ordinary and preference shares have risen to the common price of 25s. Yorkshire Electric 6 per cent. preference show an improvement at 31s. 6d., and Midland Counties 6 per cent. preference are also better at 30s. 6d. Electric Supply Corporation ordinary shares are without quotable alteration. The new County of London 4 per cent. preference are 1½d. to 3d. premium.

The rubber share market is quiet, though the price of the produce continues steadily to advance. In the iron and steel group, nothing of importance has happened during the past week. Prices are steady, but business has run on retail lines. This latter description might be applied with equal accuracy to most of the Stock Exchange markets. The heat of the earlier part of the week, and the subsequent attractions of Ascot, exercised a marked effect upon the volume of transactions round the House.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. June 19.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	74/6	—	4 0 5
Brompton Ordinary	1	7	7	34/–	—	4 2 4
Charing Cross Ordinary	1	7	7	34/6	—	4 1 2
Chelsea	1	7	7	34/–	—	4 2 4
City of London	1	7½	7½	35/–	—	4 5 9
Clyde Valley	1	7	7	38/9	—	3 12 4
County of London	1	10½	10½	55/9	—	3 15 4
Edmundson's 7% Pref.	1	7	7	34/–	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 16 0
Elec. Supply Corporation	1	11	11	73/9	—	2 17 9
Kensington Ordinary	1	7	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7½	36/3	—	4 2 8
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	51/3	—	3 18 2
Midland Counties	1	7	7	35/9	—	3 18 4
Mid. Elec. Power	1	8	8	40/–	—	4 0 0
North Eastern Electric Ordinary	1	6	6	31/9	—	3 15 0
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	53/9	—	3 14 3
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	61/3	—	3 5 3
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James' and Pall-Mall	1	7	7½	35/6	—	4 4 6
Scottish Power	1	8	8	38/9	—	4 2 6
South London	1	7	7	36/–	—	3 17 9
Westminster Ordinary	1	7	7	34/–	—	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	—	7 2 10
Yorkshire Elec.	1	8	8	47/–	—	3 8 2

PUBLIC BOARDS.

		1931.	1932.			
Central Electricity, 1950–70	Stock	5	5	116	—	4 6 2
Do. 1955–75	,,	5	5	117	—	4 5 6
Do. 1951–73	,,	4½	4½	109xd	—	4 1 1
Do. 1963–93	,,	—	3½	99	—	3 10 8
London & Home Counties, 1955–75	,,	4½	4½	110	—	4 1 10
London Passenger Transport, A...	,,	—	4½	118xd	—	3 16 4
Do. do. B...	,,	—	5	122xd	—	4 2 0
Do. do. C...	,,	—	—	74½	+1	—
West Midlands Joint Elec. 1948–68	,,	—	5	114	—	4 7 9

TELEGRAPH AND TELEPHONES.

American Tel. & Tel.	$100	9	9	116½	+3	7 14 6
Anglo-Am. Tel. Pref.	Stock	6	6	113½	–½	5 5 9
Do. Def.	,,	1½	1½	27½	–⅛	5 9 1
Cables & Wireless 5½% Pref.	,,	2¾	2¾	67½	+2	4 1 6
Do. A. 7½% Ord.	,,	Nil	Nil	15½	–⅜	—
Do. B. Ord.	,,	Nil	Nil	7½	—	—
Globe Tel. and T. Ord.	10	Nil	2½	8¼	–¼	3 0 7
Do. do. Pref.	10	6	6	12¾	—	4 14 4
Great Northern Tel.	10	20	20	38	—	5 5 3
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	,,	5	5	575xr	—	—
Do. do. Pref. Ord.	,,	8	8	157½	—	5 1 7
Brazil Traction	100	—	—	9⅞	+¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds	—	5	5	24½	—	20 8 0
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	7½	—	—
Do. 1st Bonds...	—	5	5	49½	—	10 10 6
Victoria Falls Ord.	1	15	20	6¾	+⅛	2 19 3
Yorkshire (West Riding)	1	2½	5	25/–	+⅛	4 0 0

MANUFACTURING COMPANIES

Assoc. Elec. Ord.	1	4	3	18/3	+1/–	3 5 7
Do. Pref.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	2	—	3 0 0
British Aluminium Ord.	1	5	5	28/3	—	3 11 0
British Insulated Ord.	1	15	15	68/9	—	4 7 3
Brush Ord.	Stock	Nil	Nil	33	—	—
Callender's	1	15	15	3	—	5 0 0
Do. 6½% Pref.	1	6½	6½	30/0	—	4 6 8
Crompton Parkinson Ord.	5/–	22½	12½	26/6	—	4 14 4
Do. 8% Pref.	1	8	8	32/6	—	4 18 6
Edison-Swan 1st Pref.	1	7½	7½	22/6	–2/–	6 13 4
Do. 5% Deb.	Stock	5	5	107½	+5	4 13 0
Electric Construction	1	Nil	Nil	11/3	—	—
Enfield Cable Ord.	1	25	20	86/3	—	4 13 0
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	9/6	—	—
Ever Ready	5/–	35	35	28/6	—	6 2 8
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	31/3	—	4 3 2
Do. Ord.	1	8	8	41/3	–9d.	3 17 6
Henley's	1	30	30	5¾	+¼	5 2 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 1 9
India-Rubber Preferred	1	—	—	17/6	—	—
Johnson & Phillips	1	5	5	23/3	—	4 6 0
Siemens Ord.	1	6½	4	17/6	+⅛	4 11 6
Telegraph Construction	£1	Nil	Nil	1	–1/–	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1932

29097. "Regeneration of energy by the network from valve-controlled a.c. motors." Akt.-Ges. Brown Boveri et Cie. October 23rd, 1931. (410740).

32188. "Electric supply systems." British Thomson-Houston Co., Ltd. November 13th, 1931. (410842.)

32189. "Voltage-regulating systems for mercury-arc and like rectifiers." British Thomson-Houston Co., Ltd. November 13th, 1931. (410776.)

32219. "Cores of magnetic material." Allgemeine Elektricitäts-Ges. November 12th, 1931. (Cognate application 32220/32.) (Addition to 363697.) (410777.)

32425. "Electric coupling elements." C. R. Cook. November 16th, 1932. (410815.)

32611. "Furnaces or installations for the heat-treatment of metals." Birmingham Electric Furnaces, Ltd., and A. G. Lobley. November 18th, 1932. (410845.)

32872. "Regulating transformers." International General Electric Co., Inc. November 21st, 1931. (Addition to 407411.) (410757.)

32875. "Electric discharge lamps." British Thomson-Houston Co., Ltd., and General Electric Co., Ltd. November 21st, 1931. (410787.)

32898. "Circuit embodying thermionic valves and like electron-discharge apparatus." A. H. Midgley. November 21st, 1932. (410759.)

32901. "Flywheel lighting and ignition magnetos." Fichtel and Sachs Akt.-Ges. November 21st, 1931. (410788.)

33004. "Mains-supplied radio receivers." L. A. E. Nordfalk. November 22nd, 1932. (410806.)

33006. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. H. Maggs. November 22nd, 1932. (410766.)

33027. "Electrolytic condensers." Solar Manufacturing Corporation. May 25th, 1932. (410767.)

33028. "Electrical condensers and methods of making the same." Solar Manufacturing Corporation. May 25th, 1932. (410768.)

33030. "Electric condensers." Elektrizitäts Akt.-Ges. Hydrawerk. November 24th, 1931. (410807.)

33067. "Radio-receiving apparatus." E. K. Cole, Ltd., E. J. Wyborn, A. W. Martin, and G. Bradfield. November 23rd, 1932. (410791.)

33069. "Radio-receiving sets." E. K. Cole, Ltd., and E. J. Wyborn. November 23rd, 1932. (410792.)

33120. "Luminous electric discharge tubes." Claude-General Neon Lights, Ltd., and C. Higgins. November 23rd, 1932. (410796.)

33383. "Metal-clad liquid-insulated electrical apparatus." A. Reyrolle & Co., Ltd., and A. Allan. November 25th, 1932. (410826.)

33394. "Self-starting synchronous motors." R. C. Graseby. November 25th, 1932. (410828.)

34039. "Direction responsive systems." British Thomson-Houston Co., Ltd. December 1st, 1931. (410871.)

34115. "Sparking plugs." E. J. Buckingham. December 2nd, 1932. (410873.)

34468. "Control systems for vapour-electric discharge devices." Soc. Anon. Hewittic and M. Demontvignier. December 5th, 1931. (410880.)

35064. "Steel lattice poles and towers." Callender's Cable and Construction Co., Ltd., and C. V. Crowther-Smith. December 10th, 1932. (410884.)

35229. "Trunk communication cable installations employing amplifiers such as long-distance telephone cable installations." Siemens and Halske Akt.-Ges. December 12th, 1931. (410887.)

36460. "Apparatus for laying underground cables." County of London Electric Supply Co., Ltd., W. J. H. Wood, Ransome and Rapier, Ltd., and W. J. Bowtell. December 23rd, 1932. (410900.)

1933

548. "Electric motor control systems." British Thomson-Houston Co., Ltd. (General Electric Co.). January 6th, 1933. (410905.)

1671. "Liquid-immersed electric switches." W. A. Coates and Associated Electrical Industries, Ltd. January 18th, 1933. (410909.)

1723. "Electrical production of music." Allgemeine Elektricitäts-Ges. January 18th, 1932. (410910.)

2134. "Cables or the reinforcing-strands of conductor cables." Aluminium, Ltd. April 28th, 1932. (410915.)

6329. "Hydrometers particularly for indicating the state of charge of electric accumulators." F. H. Alston. March 23rd, 1933. (410935.)

8650. "Fittings for the overhead contact conductors of electric traction systems." British Insulated Cables, Ltd., and J. W. Astley. March 22nd, 1933. (410952.)

9070. "Electric clock systems and method of producing timed electrical impulses therein." International Time Recording Co. March 28th, 1932. (410954.)

9170. "Conductors for conveying electric currents through vitreous envelopes." General Electric Co., Ltd., and F. A. Foxon. March 27th, 1933. (410955.)

9799. "Electrical combination switches." S. E. Josolyne. March 31st, 1933. (410958.)

12805. "Optical apparatus for use in the transmission of views by electricity." H. Papst. May 2nd, 1932. (410996.)

14636. "Automatic circuit-breaker for ignition circuits of motor-driven vehicles and crafts operable on collision or overturning." H. M. Salmond. May 20th, 1933. (410969.)

17163. "Electrolytic condensers." Elektrizitäts Akt.-Ges. Hydrawerk. June 25th, 1932. (410978.)

17420. "Control devices for continuous-current electrical machines." Forges et Ateliers de Constructions Electriques de Jeumont. June 20th, 1932. (410980.)

19095. "Electric battery lamps." Batterien-U Elemente-Fabrik System Zeiler Akt.-Ges. March 28th, 1933. (410985.)

22986. "Luminous electric discharge lamps." General Electric Co., Ltd. August 19th, 1932. (410994.)

24524. "Subaqueous signalling apparatus." Submarine Signal Co. October 22nd, 1932. (411000.)

25034. "Photo-electric cells." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 31st, 1932. (411002.)

25625. "Electric motors, more particularly for submersible pumps, boring apparatus and the like." L. Deisenhammer. February 21st, 1933. (411005.)

27087. "Train-operated electric contact devices for railways and the like." W. W. Steele and W. R. Sykes Interlocking Signal Co., Ltd. October 2nd, 1933. (411012.)

28154. "Device for giving warning of the failure of a lighting circuit in automobiles, motor cycles and other vehicles." F. Southam. October 12th, 1933. (411018.)

29079. "Systems of regenerative braking for electrically driven vehicles." British Thomson-Houston Co., Ltd. October 21st, 1932. (411023.)

30489. "Electric motors." British Thomson-Houston Co., Ltd. November 4th, 1932. (411027.)

30755. "Electric heater for liquids." C. Cante. November 6th, 1933. (411028.)

32002. "Electrical systems and methods for treating gaseous fluids." Lodge-Cottrell, Ltd. (Research Corporation of New York). November 16th, 1933. (411033.)

33191. "Electric motor control." British Thomson-Houston Co., Ltd. November 30th, 1932. (410562.)

34429. "Electrically heated annealing furnaces." Akt.-Ges. Brown Boveri et Cie. December 7th, 1932. (411041.)

1934

1967. "Spinning-regulator for electrically driven ring spinning-machines." Allmänna Svenska Elektriska Aktiebolaget and A. Johansson. January 19th, 1934. (Addition to 399384.) (411066.)

2231. "Electrically controlled gauges." Etablissements E. Jaeger. February 23rd, 1933. (411069.)

2615. "Mechanical means for converting direct current into alternating current." F. Uebl. January 25th, 1934. (411071.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 13th :—

Univex. No. 550096. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Klix, Ltd., 131, Regent Street, W.1.

Genristo (lettering and design). No. 549279. Class 13. Electrical heating elements for electric fires, kettles, irons, and the like.—General Resistors, Ltd., 287, Ilkeston Road, Nottingham.

Welding Supplies, Ltd., London (lettering and design). No. 549472. Class 13. Electrodes of ordinary metal for welding.—Welding Supplies, Ltd., Anchor and Hope Lane, Charlton, S.E.

Domestaflex. No. 549959. Class 40. India-rubber-covered wire.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

The trade mark registered recently by Messrs. Johnson, Matthey & Co., Ltd., is "Matthelytic" not "Matthelyte," as stated in our June 1st issue.

Education in Welding

SOME time ago an advisory committee on welding was established by the City and Guilds of London Institute, the body comprising, among others, representatives of the Institution of Mechanical Engineers, the Institution of Welding Engineers, the Board of Education, and several technical institution associations. The committee has recently recommended a scheme, which the Institute has adopted, for examinations on the subject of electric arc and oxy-acetylene welding as a result of which it is hoped that classes in such subjects will be formed in the various technical institutions throughout the country.

In order to be eligible for the City and Guilds examination in electric arc welding a candidate must have attended a course of instruction at a technical institution covering a period of not less than two years, with attendance at classes for a total of not less than 100 hours in each year of the course, and must be certified by the principal to have carried out satisfactorily three specified welding tests and at least three of eight other tests. External candidates must apply before February 14th in each year to the nearest technical institution holding classes in electric arc welding to be allowed to submit themselves to similar practical tests so that the principal may certify that they have had experience of welding work in practice and, as shown by the test results, that they have reached a standard of efficiency equal to that which a student will have normally gained at the end of a two-year course of instruction.

The examination will consist of two written question papers, each of three hours' duration, *i.e.*, a general paper on welding science, metallurgy, sketching, and drawing, with questions on fundamental principles of electric arc welding, and a special paper based on the detailed syllabus for electric arc welding. When a candidate has passed in both the general and sectional papers he will be granted a certificate.

The scheme, full particulars of which can be obtained from the City and Guilds of London Institute, 31, Brechin Place, South Kensington, S.W.7, is to come into operation at the beginning of the 1934-35 session.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Houses (300); borough surveyor.

Ashby Woulds.—Houses (48): Simmons Bros. & Wardle, builders, Rothley.

Bexley.—Swimming pool (£30,000), with electrical work, including floodlighting; G. A. Joy, U.D.C. surveyor.

Billingham.—Public baths (£18,000); W. Pearson & Sons, builders, West Hartlepool.

Birmingham.—Church, Marston Green, for the Rev. H. C. R. Eltoft, of the Parish Church (£10,000); T. A. Knight, architect, Victoria Buildings, Temple Row. Hospital, 35, George Road, for the Midland Skin Hospital; C. Wade & Co., Ltd., constructional engineers, Aston Road. School, Woodhouse Road, Harborne, for E.C.; Buckland & Haywood, architects, Norwich Union Chambers, Congreve Street.

Bishop Auckland.—Houses (24); Crawford & Robson, architects, Market Chambers, Bishop Auckland.

Blackpool.—Houses (23), Montpelier Avenue; S. Schofield. Houses (29), Wynwood Avenue; H. Fielding & Son. Stadium; borough engineer.

Bowshaw (CHESTERFIELD).—Houses (400), Sheffield Road, for M. J. Gleeson, Ltd., Chesterfield Road, Beauchief, Sheffield.

Bradford.—Houses (342), Knowle Park Estate, Whitehall Road; E. & T. Bower, Ltd., builders, Rookery Lane, Halifax. Houses (135) and shops, Southfield Lane; A. Shepherd & Sons, builders, Clayton. Houses (89), Ransdale Road, Manchester Road; J. B. Bailey & Son, architects, Airedale Buildings, North Street, Keighley.

Bridlington.—Houses (42); borough surveyor.

Bromley (KENT).—Houses (92), New Street Hill, Sundridge Park, for J. W. Wilson.

Carlisle.—Houses (50), Currock Estate, and 28 houses, Raven Nook; city engineer.

Chesham.—Houses (30), Pond Park Estate; F. T. Moss, U.D.C. architect, 33, High Street.

Chesham.—Houses (30), Pond Park Estate; F. T. Moss, Browne, county architect, the Castle, Chester.

Chesterfield.—Houses (48) and bungalows; R.D.C. housing architects. Offices, &c. (£17,525), for Chesterfield and Bolsover Water Board; Houfton & Kington, architects.

Clacton-on-Sea.—Houses (26), Fourth Avenue, for J. Holland Hill & W. King.

Colne.—Houses (62), Cookhouse Estate; borough surveyor.

Coulsdon.—Houses (28), Tudor Close; Firmus Constructions, Ltd. Houses (36), Woodlands Grove; P. Richardson.

Dalkeith.—Houses (148), Woodburn Estate; J. L. M'Dougal, burgh surveyor, Municipal Buildings.

Derby.—Houses (100), Cowsley Estate; Harris Bros., builders, Marehay.

Dudley.—Chapel for Rev. Herbert Hill and trustees of the Baptist Association (£7,000); Webb & Gray, architects, 200, High Street. School, Wren's Nest, for Borough E.C.; director of education.

Dundee.—First section to school (£63,500) for the Corporation.

Dunstable.—Printing factory, for Waterlow & Sons, Ltd.; W. Summerfield & Son, builders.

East Sussex.—Senior schools, Seaford, for County E.C.; director of education, Chichester.

Enfield.—Houses, Sunnyside Estate; Homemakers, Ltd.

Essex.—Casual wards, Epping, and junior school, Dickens Avenue, Tilbury, for County E.C.; J. Stuart, county architect, Chelmsford.

Falkirk.—Child welfare clinic (£4,000); burgh surveyor.

Farnborough (HANTS).—Houses (46), Ship Lane, for Scott & Co.

Gateshead.—Houses (350) for the Sutton Dwelling Trust; C. S. Errington, architect, 21, Grainger Street, Newcastle-on-Tyne.

Gatley.—Houses (108), Marple Hall Estate, near Rose Hill; J. Williams, builders, 9, Green Walk.

Glossop.—Rebuilding stores for the Glossop Dale New Industrial Co-operative Society, Ltd., Railway Street (£7,000); S. Goddard, Ashes.

Godstone (SURREY).—Extensions to public offices (£8,000); Hawkins & Co., builders.

Golborne.—Houses (33), Sandy Lane and Bodden Street; F. T. Nicholls.

Grays Thurrock.—Houses (60); T. Healey, surveyor.

Great Yarmouth.—Factory, Crittens Road; R. H. Porter, Ltd.

Haddington.—Houses (100); W. L. Hogg, burgh surveyor, Fire Station.

Halesowen.—Houses (30), Hawne Lane; W. J. Tolley, builder.

Haslingden.—Houses (40), Longshoot Estate (£13,005); Executors of T. Collinge, builders, Victoria Street.

Hebden Bridge.—Clothing factory; Sutcliffe & Sutcliffe, architects, New Road.

Hemel Hempstead.—School (£11,759), for Borough E.C.; Major Maule, architect. Houses (50); borough surveyor.

Hornchurch.—Cinema for D. J. James; W. F. Blay, Ltd., builders, Spital Street, Dartford.

Ilford.—Houses, Parkside Estate; New Ideal Homesteads, Ltd. School, Barkingside, for Borough E.C.; L. E. J. Reynolds, education architect, Town Hall.

Irish Free State.—(BALLINA, Co. MAYO).—Houses (34); P. A. Calleary, engineer, Pearse Street. (Co. WICKLOW).—Technical schools, Baltinglass and Carnew, and additions to technical school, Arklow, for the Vocational E.C.; T. J. Cullen, architect, 25, Suffolk Street, Dublin.

Kent.—Central schools, St. Mary Cray and Orpington, for County E.C.; director of education, Maidstone.

Kerrier (CORNWALL).—Houses (50), Germoe area; R.D.C. surveyor.

Kidderminster.—Houses (60), Foley Park Estate; J. Hawcroft, borough engineer.

Lanarkshire.—Houses (144), electrical work, for C.C.; P. C. Smith, 13, Clydesdale Street, Hamilton.

Leicester.—Houses (73), Freake's Ground, Fosse Road North; architect, 18, Highcross Street.

Lincolnshire.—Radium and Deep X-ray Therapy Institute, Lincoln, for C.C.

Llandudno.—Houses (56); U.D.C. surveyor.

London.—(CAMBERWELL).—Clearance and re-housing Nigel Buildings area (£26,000); L.C.C. architect. (DULWICH).—Tenements, East Dulwich Estate (£22,645); Wilson, Lovatt & Sons, Ltd., Wolverhampton. (EALING).—Houses (48), Conway Crescent; R. Lancaster & Sons, 30, Ealing Road, Wembley. Houses (132), various roads; Houselands, Ltd., 47, Victoria Street, S.W.1. Houses (32), Whitton Avenue, Northolt; Swannell & Sly, architects, High Street, Rickmansworth. Junior and girls' schools, Wood End, and boys' school, Horsenden; A. & B. Hanson, Ltd., Southall. (E.C.).—Subway, King William Street (£45,000); city engineer. (LEWISHAM).—School, Hall Park Estate, for the London E.C.

Manchester.—Houses (28), Harrop Street, Gorton; Provincial Building Co., Ltd., builders, 16, Deansgate. Houses (44), Jackson Street, Fleet Street, King Clost and Abbey Hey Lane, Gorton; E. E. Coleman, builder, Washway Road, Sale. Block of offices, St. Peter's Square for the Friends' Provident and Century Life Office, 7, Leadenhall Street, E.C.3. Municipal Junior School, New Moston, for E.C.; Surveyor's department, Education Offices, Deansgate.

Margate.—Town hall, &c. (£250,000); Town Clerk.

Market Drayton.—Houses (28), £8,700; T. Healey, surveyor.

Marlborough.—Houses (26), Cherry Orchard; E. C. Kitchen, borough surveyor.

Northamptonshire.—Nurses' home for County Mental Hospital, Berrywood; Gotch, Saunders & Surridge, Bank Chambers, Kettering.

Norwich.—School (200 places), Catton Grove, for Borough E.C.; director of education.

Paisley.—Wing for museum (£24,000); burgh surveyor.

Perth.—Baths, Dunkeld Road (£20,000); T. M'Laren, burgh surveyor, City Chambers.

Radlett (HERTS).—Houses (1,000), Newberries Park Estate; Sir Arthur du Cros.

Reigate.—Factory extensions, Redhill; E. Grindrod Welsby, architect, 102, Croydon Road.

Renfrewshire.—School, Williamwood, Giffnock, Paisley, and three R.C. schools, Paisley (£80,000); Master of works, County Council, Paisley.

Rushden.—Houses (56), Highfield Road (£16,349); W. Thompson & Sons, Ltd., Irthlingborough. Offices, Inchester Road; Padburne & Bennett, Ltd.

St. Albans.—Omnibus station and garage for the London Passenger Transport Board.

Salford.—Infants and junior school, Lowcock Street, Broughton, for St. Clement's C.E. School Managers; A. Tomkins, builders, Avenue Works, Lower Broughton, Manchester.

Salisbury.—Houses (42), Pembroke Park Estate; Building & Public Works Construction Co., Ltd., builders, Swindon.

Scarborough.—Extensions, the Convent, Queen Street; Jones & Rickaby.

Shropshire.—Adapting Madeley Institution for sick cases, with nurses' home (£6,207), for the P.A.C.; clerk, Shrewsbury. Additions to various schools for County E.C.; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Southport.—Church, Lord Street West, for the trustees; Arnold England, architect, Carlton Chambers, St. Andrew's Road, South, St. Anne's-on-Sea.

Spalding.—Houses (42), Marsh Rails Road; U.D.C. surveyor.

Stanford-le-Hope (ESSEX).—Cinema, Corringham Road, for Boyce Bros.

Stockton-on-Tees.—Butter factory, Whitehouse Farm, Bishopton Road, for R. Spark & Sons. Senior school, Newham Grange (£23,565), for Borough E.C.; director of education.

Stoke-on-Trent.—Houses (30), Cavour Street, Etruria; J. B. Shaw.

Stornoway.—Infectious diseases hospital (£5,000); the medical officer.

Stourbridge.—Library on site of the old Council Offices, Lye (£3,000), with electrical work; T. W. Edwards & Co., builders, Audnam.

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Torquay.—School hall, Ilsham School, and senior school, for E.C.

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Wallsend.—Houses (94), Bewicke School Estate, and 84, Archer Street; Ball, Thomas & Lister, Ltd.

Walsall.—Houses (331), Grange Estate, Bescot; L. Dickinson, 59, Lower Foster Street.

Wellingborough.—Laundry, London Road; Midland Co-operative Laundry Association. Houses (26), Brickhill Road; Ireson & Son.

West Hartlepool.—Houses (32), South and North Drive; Harland & Parker, Ltd., builders, 202, York Road.

West Sussex.—Extensions to High School for Girls, Horsham (£11,350), and School of Art, Worthing (£4,850), for County E.C.

Woking.—Extensions, Southern Railway Servants' Orphanage (£21,000); secretary, Oriental Road.

Wolverhampton.—Houses (98), Aldersley Road; Blackburn & Crossland. Houses (30), Church Road, Bradmore; G. Wilkes. Houses (48), Dunstall Hill Estate; H. Grindley. Houses (30), Marsh Lane; L. T. Taylor. Concert hall and billiard room, Lowe Street; Whitmore Institute, Ltd. Extensions, New Cross Hospital (£6,396); F. & E. V. Linford, Ltd., Cannock. Works extensions, Stafford Road; Goodyear Tyre Co., Ltd.

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COMPANY MEETING.

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MR. J. S. AUSTEN'S SPEECH.

THE thirty-eighth ordinary general meeting of the above Company was held on June 15th at Winchester House, Old Broad Street, London, E.C.

MR. J. S. AUSTEN (the chairman) said: Ladies and gentlemen, a year ago I opened my speech with these words:—"My speech to-day is intended to strike a cheerful note." At that time we were passing through a period of gloomy depression and mine was the first speech which struck a cheerful note. I may say that it was a very long time before any other chairman ventured to do the same. Unfortunately, my words did nothing towards removing that depression, probably for the reason that very little attention is ever paid to anything which I say—(laughter)—but what I said was true. To-day I suppose that half of the speeches which are published strike a cheerful note, and it is justified not only generally but with regard to this company, because, as you know, we are able to-day to show you an increased profit of £17,000, and with that sum I myself am satisfied. In fact, it is considerably more than I ventured to expect.

I must point out, however, that we have not yet equalled our peak year, which was 1931, when our profits were about £9,000 more than they are to-day. The question which I know you will want me to answer is whether in the current year we can again reach that peak. Estimates in this company are very difficult to make, and I have not made one, but, if you will allow me to guess, I should guess that we should do it. (Applause.) That, I think, is all I have to say about the prospects of the coming year.

INVESTMENTS.

I have found that there is a great deal of misapprehension as to what this company really is. I think it arises partly from the fact that we call ourselves "The British Electric Traction Co." and people know that electric traction, so far as this company is concerned, is practically a thing of the past, and they wonder how we make our money. Technically we are a trust company, in that our income is derived from a holding of investments, but we differ very materially in one respect from any other trust company of which I have any knowledge, because the great bulk of our investments is in companies in whose management we are actively concerned, and, I might say, for whose management we are largely responsible. That puts you in the position of saying that if we do not earn any money it is our fault, because it is our companies that have done it. We cannot, like other trust companies, say that it is the fault of other people. If, perhaps, such a day should ever come, I should certainly say that it was not our fault. (Laughter.) We hope that that day will never come.

The other class of our investments is what I would call outside investments. In the first class which I have mentioned we hold £4,285,000, and in the second class we hold £1,551,000, both those figures being approximate.

DEFERRED STOCK.

I always make it a custom to say something about our deferred stock, because it is unique in its way, but whatever I say about it to-day I can only repeat what I have said to you before, and that is that it is a stock from which you must not look for income but for capital increment. It is a stock which, if you want to make money out of it, you must hold and not sell. At the moment there must be very few people who have sold their stock and can now say that they are better off than if they had kept it. A man who was fortunate enough to get £100 of stock when it was being given away by the company and has kept that stock with its bonus additions, is now, in round figures, worth about £2,000.

On the other hand, it is essentially not a stock which anyone should buy with the intention of selling his bonus as and when he gets it. Such a system of finance is entirely unsound. One newspaper, I see, refers to it as a "rich man's stock"; that is perfectly correct, but I myself would prefer to call it an automatic savings bank, and I think that if you will only regard it in that light you will none of you ever regret it.

The report and accounts were unanimously adopted, and the other business was duly transacted.

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